

# **Five Year Review**

## **Boomsnub/Airco Superfund Site**

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**United States Environmental Protection Agency**  
Region 10  
1200 Sixth Ave.  
Seattle, WA 98101

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**September 2003**

**FIVE-YEAR REVIEW REPORT**

**First Five-Year Review Report**

**for**

**Boomsnub/Airco Superfund Site**

**Hazel Dell**

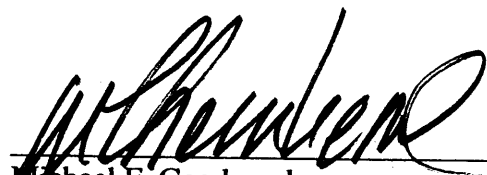
**Clark County, Washington**

**Prepared By:**

**United States Environmental Protection Agency**

**Region 10**

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25 Sept. 2003

Date

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FIVE YEAR REVIEW  
Boomsnub/Airco Superfund Site  
RAC EPA Region 10  
Work Assignment 098-FRFE-103N

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List of Documents Reviewed  
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## ABBREVIATIONS AND ACRONYMS

AOC	Administrative Order on Consent
ARAR	Applicable, Relevant and Appropriate Requirement
CD	Consent Decree
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
COC	Contaminant of Concern
CPU	Clark Public Utilities
cy	cubic yard
EPA	Environmental Protection Agency
ESD	Explanation of Significant Difference
gpm	gallons per minute
MCL	Maximum Contaminant Level
MTCA	Model Toxics Control Act
NCP	National Contingency Plan
NPL	National Priorities List
OU	Operable Unit
PQL	Practical Quantification Limit
RA	Remedial Action
ROD	Record of Decision
RPM	Remedial Project Manager
SARA	Superfund Amendments and Reauthorization Act
TBC	To Be Considered
TCE	Trichloroethene
µg/L	microgram per liter
VOC	Volatile Organic Compound

## EXECUTIVE SUMMARY

Soil and groundwater contamination was detected at the Boomsnub/Airco Superfund Site in the early 1980s. Principal contaminants of concern included chromium, lead, and volatile organic compounds. In response to the contamination, a number of investigations were performed to identify the source of contamination as a former chromium plating facility, Boomsnub/Pacific Northwest Plating Company (Boomsnub), and a specialty gas manufacturer, BOC Gases (formerly Airco). Remedial measures were identified and implemented. These measures included institutional controls, a groundwater pump and treatment system and removal and off-site disposal of chromium contaminated soil. Institutional controls include deed restrictions and controlled site access for the Boomsnub property to prevent soil contamination below 15 feet in depth from being disturbed without appropriate precautions and preclude residential use of the Boomsnub property. Long-term compliance monitoring for contaminated groundwater is also performed to assess the operational efficiency and monitor groundwater contaminant migration. Soil removal was performed to prevent site related contaminants, chromium and lead, from either serving as an uncontrolled, on-going source of contamination to groundwater or creating an exposure hazard to future site workers. Groundwater extraction and treatment has been performed to remove chromium and volatile organics from groundwater. Groundwater contamination principally occurs in a shallow groundwater-bearing zone referred to as the Alluvial aquifer. The Alluvial aquifer is not currently used for municipal water supplies, however private wells have been installed in the Alluvial aquifer. Contamination has also been detected, although at considerably lower concentrations, in the deeper groundwater-bearing zone, the Troutdale aquifer, that serves as the municipal water supply. Municipal water supply wells are not located in an area known to be contaminated.

The groundwater pump and treatment system has been operational since 1990 and over time has been modified and/or upgraded to increase contaminant removal. The system currently operates under the city of Vancouver Permit No. 99-03 Mod 2; treated water is discharged to the City sanitary sewer system. System components and groundwater quality are continually monitored.

Site access restrictions minimize the potential for exposure of the general public to site conditions. Long-term compliance monitoring ensures that the system is operating in accordance with applicable permit requirements and that necessary operational modifications are readily identified and implemented. Soil removal was effective at achieving industrial soil cleanup levels at the site as required in the Record of Decision. Groundwater pump and treat continues to be effective at removing chromium and VOCs from groundwater. As of July 2003, over 21,500 pounds of chromium and 1,945 pounds of the volatile organic compound trichloroethene (TCE) have been removed from groundwater since 1995. Concentrations of chromium and TCE within the plume have decreased significantly since initiation of system operation.



Groundwater modeling is currently being performed to assess and further define groundwater flow and contaminant fate and transport. Results of the model will be used to determine whether increasing system flow rates as specified in the ROD will enhance contaminant removal at the site. Source control measures, in situ well stripping and soil vapor extraction, are under development for addressing TCE source areas.

Remedial actions performed at the site are protective of human health and the environment. Chromium and lead contaminated soils through a depth of 15 feet exceeding cleanup levels that presented a source of contamination to groundwater and limited future industrial use of the property have been removed from the site and disposed of off-site. Continued groundwater pump and treatment ensures that groundwater contamination is contained and that the potential for migration is limited. Future volatile organic source control measures will further minimize the potential for migration of volatile organics.

The effectiveness of remedial actions at the site will continue to be monitored on an on-going basis. Quarterly and annual system operations reviews will continue and a reevaluation of the protectiveness of site remedial actions will be performed in 2008 as part of the five-year review process required for the site under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA).

FIVE YEAR REVIEW  
Boomsnub/Airco Superfund Site  
RAC EPA Region 10  
Work Assignment 098-FRFE-103N

Five-Year Review Summary Form  
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## FIVE-YEAR REVIEW SUMMARY FORM

<b>SITE IDENTIFICATION</b>		
<b>Site name (from WasteLAN):</b> Boomsnub /Airco Superfund Site		
<b>EPA ID (from WasteLAN):</b> WAD009624453		
<b>Region:</b> 10	<b>State:</b> WA	<b>City/County:</b> Hazel Dell / Clark
<b>SITE STATUS</b>		
<b>NPL status:</b> : <input checked="" type="checkbox"/> Final Deleted Other (specify)		
<b>Remediation status</b> (choose all that apply): : Under Construction : <input checked="" type="checkbox"/> Operating Complete		
<b>Multiple OUs?:</b> <input checked="" type="checkbox"/> YES NO		<b>Construction completion date:</b> Construction Not Yet Completed
<b>Has site been put into reuse?</b> YES : <input checked="" type="checkbox"/> NO		
<b>REVIEW STATUS</b>		
<b>Lead agency:</b> : <input checked="" type="checkbox"/> EPA State Tribe Other Federal Agency _____		
<b>Author name:</b> Lee Marshall		
<b>Author title:</b> Site Manager		<b>Author affiliation:</b> US EPA Region 10
<b>Review period:</b> January 2003 to September 2003		
<b>Date(s) of site inspection:</b> July 2003		
<b>Type of review:</b> <input checked="" type="checkbox"/> Post-SARA Pre-SARA : NPL-Removal only Non-NPL Remedial Action Site NPL State/Tribe-lead Regional Discretion		
<b>Review number:</b> : <input checked="" type="checkbox"/> 1 (first) 2 (second) 3 (third) Other (specify) _____		
<b>Triggering action:</b> Actual RA Onsite Construction : <input checked="" type="checkbox"/> Actual RA Start Soil OU Construction Completion Previous Five-Year Review Report Other (specify)		
<b>Triggering action date (from WasteLAN):</b> 09 / 1998		
<b>Due date:</b> 09 / 2003		

## **FIVE-YEAR REVIEW SUMMARY FORM (Continued)**

### **Issues:**

Soil and groundwater contamination was detected at the Boomsnub/Airco Superfund Site in the early 1980s. Principal contaminants of concern included chromium and volatile organic compounds. In response to the contamination, a number of investigations were performed to identify the source of contamination as a former chromium plating facility and a specialty gases manufacturer, BOC Gases (formerly Airco). Remedial measures were identified and implemented. These measures included institutional controls, a groundwater pump and treatment system and removal and off-site disposal of contaminated soil. Principal issues identified in this five year review include:

- Deed restrictions for the Boomsnub property to limit future use of the property have not been formally recorded
- Limited volumes of contaminated soil above ROD specified cleanup levels remain on the site in the vicinity of the groundwater treatment facilities.
- The ROD specified treatment system capacity of 200 gallons per minute has not been achieved; increasing capacity to 200 gallons per minute may be limited by system components.
- BOC Gases Soil OU remedy remains to be implemented
- Uncertainty exists with regard to the long-term ability of the remedy to remain protective of drinking water supplies in the area.
- Significant opportunities including alternate discharge options and system modifications may exist to reduce operational costs of remedy implementation.
- Regional development needs to be coordinated with site activities to minimize the impacts of development on system components and operations.

### **FIVE-YEAR REVIEW SUMMARY FORM (Continued)**

#### **Recommendations and Follow-up Actions:**

Record deed restrictions for the Boomsnub property to limit future use of the property.

Upon decommissioning, demolition and removal of the existing groundwater treatment facilities remove soils exceeding cleanup levels known to exist below site facilities to a depth of 15 feet for off site disposal in accordance with the conditions identified in the ROD.

Complete groundwater modeling to assess contaminant migration potential, evaluate benefits of increasing system capacity on contaminant removal and evaluate the efficiency of the remedy in removing site contaminants. Use modeling results to modify the remedy as appropriate.

Designs have been completed and construction is scheduled for the implementation of the BOC Gases Soil OU remedy.

Complete modeling of contaminant migration potential from the Alluvial aquifer. Continue groundwater monitoring of the Troutdale aquifer.

Regional development needs to be coordinated with site activities to minimize the impacts of development on system components and operations.

#### **Protectiveness Statement(s):**

The remedy at the Boomsnub/Airco Superfund Site is expected to be protective of human health and the environment upon completion and in the interim, exposure pathways that could result in unacceptable risks are being controlled.

**Other Comments:** None

\* ["OU" refers to operable unit.]

## 1.0 INTRODUCTION

The purpose of five-year reviews is to determine whether the remedy at a site is protective of human health and the environment. The United States Environmental Protection Agency (EPA) prepared this five-year review pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) §121 and the National Contingency Plan (NCP). CERCLA §121 states:

*If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that action is appropriate at such site in accordance with section [104] or [106] of the NCP, the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.*

The agency interpreted this requirement further in the NCP as codified as follows in 40 Code of Federal Regulations (CFR) §300.430(f)(4)(ii):

*If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action.*

This five-year review is for remedial actions implemented at the Boomsnub/Airco Superfund Site in Hazel Dell, Washington. This review was conducted from January to September 2003 for the period of September 1998 through September 2003. This report documents the results of the review.

This is the first five-year review for the Boomsnub/Airco site. The triggering action for this review was soil remedial activities initiated at the site in September, 1998. The five year review is required due to the elevated concentrations of chromium and volatile organic compounds including trichloroethene (TCE) that remain in groundwater and soils at the site above ROD specified cleanup levels.

## 2.0 SITE CHRONOLOGY

**Table 2-1**  
**Chronology of Site Events Through February 2002**

Event	Date
Initial discovery of problem or contamination	Washington Department of Ecology (Ecology) identified chromium in the groundwater – 1987. Additional investigation by Ecology to determine lateral extent of contamination – 1990 to 1994. Ecology determined volatile organic constituents (VOCs) present in groundwater at concentrations presenting human health concerns – 1991. BOC Gases Investigations 1991 to 1994
Pre-NPL responses	Limited pump and treat system in place – 1990.
NPL listing	April 25, 1995 (60 Fed. Reg. 20330)
Removal actions	Pump and treat system operation 1990-present Removal of 6,000 cy soil (1998) Removal of 2,500 cy soil (2001) Initiated VOCs source removal remedy (2003)
Remedial Investigation/Feasibility Study complete	February 3, 2000
Remedial System Evaluation	February 2002
ROD signature	February 3, 2000 September 29, 1997 (Interim Action Groundwater Pump & Treat)
ROD Amendments or ESDs	None
Enforcement documents (CD, AOC, Unilateral Administrative Order)	Agreed Order – Ecology, MTCA – BOC Gases property – 1993 Unilateral Admin Order, Boomsnub Property– May 13, 1994 (Abate threat and secure access) Administrative Order on Consent January 17, 1997 (PRP agrees to cost) Unilateral Admin Order, Boomsnub Property – January 29, 1998 (Perform RI/FS) Boomsnub Consent Decree July 31, 2000 (Implement ROD) Administrative Order on Consent January 8, 2001 (Interim removal) Administrative Order on Consent April 4, 2002 (PRP sewer line) Administrative Order on Consent September 12, 2002 (PRP operation)
Remedial design start	November 11, 1999 (air stripper); February 3, 2000 (soil removal); January 8, 2001 (gravity sewer)
Remedial design complete	January 8, 2001 (air stripper); March 1, 2001 (soil removal); September 27, 2001 (gravity sewer)

**Table 2-1 (Continued)**  
**Chronology of Site Events**

<b>Event</b>	<b>Date</b>
Actual remedial action start	January 13, 1998 (soil removal); March 19, 2001 (soil removal); September 27, 2001 (gravity sewer)
Construction dates (start, finish)	June 20, 1994 - January 13, 1998 groundwater treatment system operation and expansion March 19, 2001 – April 27, 2001soil removal January 13, 1998 – April 4, 2002; System operation by EPA April 4, 2002 System operation transferred to BOC Gases September 27, 2001 – December 17, 2002 Gravity sewer line installation
Construction completion date	Not yet completed
Final Close-out Report	Not yet completed
Deletion from NPL	Not yet completed
Previous five-year reviews	No previous reviews.

## **3.0 BACKGROUND**

### **3.1 PHYSICAL CHARACTERISTICS**

The Boomsnub/Airco Superfund Site is located in Hazel Dell, Clark County, Washington approximately two miles north of Vancouver, Washington and approximately two miles east of Interstate 5 (I-5) and one-mile west of Interstate 205 (I-205) near NE 78<sup>th</sup> Street and NE 47<sup>th</sup> Avenue (Figure 1). The site consists of the 0.75-acre Boomsnub property, a former chromium plating facility; the 11-acre BOC Gases property, and a co-mingled groundwater plume of chromium and volatile organic constituents that extends approximately 4,000-feet downgradient (to the west-northwest) from the properties. The site is bordered by a mixture of residential, commercial, and light industrial properties.

### **3.2 LAND AND RESOURCE USE**

The Boomsnub property was the location of a chrome plating facility from 1967 to 1994, when it ceased operation under a Unilateral Administrative Order (UAO) from the EPA. The 11-acre BOC Gases property was originally owned and operated by Airco and is now operated by BOC Gases for the manufacture and distribution of specialty compressed gases.

Four principle geologic units underlay the site: recent flood plain alluvium, Pleistocene Alluvial deposits (Alluvial aquifer), the Upper Troutdale formation, and the Lower Troutdale formation. Site related contamination has been detected primarily in the Alluvial aquifer, but recent sampling indicates low concentrations of trichloroethene (TCE) in the Upper Troutdale aquifer. The Upper Troutdale serves as a primary water supply for Clark County.

Several private wells associated with individual residences in the vicinity of the site have been identified in both the Alluvial and Upper Troutdale aquifers. None of the private wells within the area of groundwater contamination are currently being used for drinking water, although some may be used for domestic uses such as garden or lawn irrigation. The majority of residences are connected to the municipal water system owned by Clark Public Utilities (CPU); new residences in the area are required to be connected to the CPU water supply. CPU wells are installed in the Upper Troutdale formation; the closest CPU well to the site is approximately 2,000-feet southwest of the contaminant plume. This well is sampled regularly; site-related contamination has not been found in this well.

The area associated with groundwater contamination comprises various parcels of land zoned for commercial, light industrial and residential uses, with large tracts of currently undeveloped land. Long-term businesses in the immediate area include the former Permalume Plastics, GL&V Cellico (fiberglass tank manufacturer), Speeds Towing and a Shell gasoline service station. The



BOC Gases property is zoned for light industrial use. A residential development is located adjacent and southwest of the facility.

### **3.3 HISTORY OF CONTAMINATION**

The ROD identifies three Operable Units (OUs) at the site: the Boomsnub Soil OU, the BOC Gases Soil OU and the Site Wide Groundwater OU. Contaminants of concern (CoCs) for the Boomsnub Soil OU include lead and chromium resulting from former plating operations at the site; CoCs for the BOC Gases Soil OU include TCE and other volatile organic constituents previously used in the manufacturing operations. Chromium and TCE are the principal CoCs in the site-wide groundwater unit.

Chromium was identified in soils and groundwater by Ecology in 1987. To address chromium in groundwater, a limited groundwater pump and treat system was put in place in 1990 by Ecology. Volatile organics were identified in groundwater in 1991. Additional investigation to further define the lateral extent of chromium and volatile organics in groundwater was conducted from 1990 to 1994 by Ecology and BOC Gases. During this time, the extraction and treatment system was incrementally expanded.

The groundwater plume of dissolved chromium and TCE flows west-northwest from the Boomsnub and BOC Gases properties. The plume extends approximately 4,000-feet from the site in a narrow band that is up to 900-feet in width. The plume migrates downward in the alluvial aquifer with increasing distance from the source areas. By mid-plume (approximately 2,000 feet from the site), the contamination is generally found moving along the bottom of the Alluvial aquifer. The chromium contamination appears to be confined to the Alluvial aquifer. The TCE contamination has permeated through to the Upper Troutdale aquifer and has been detected at low concentrations in an Upper Troutdale monitoring well 500-feet to the west-southwest of the BOC Gases property as well as one additional downgradient monitoring well.

### **3.4 INITIAL RESPONSE**

Extraction and treatment of chromium contaminated groundwater by the Boomsnub Corporation began in May 1990 by order of Ecology. The EPA assumed responsibility for the site in 1994 and following the issuance of a UAO that forced Boomsnub to cease operations, EPA removed more than 400 drums of waste, demolished and removed site buildings and plating tanks, and removed and disposed off-site, over 6,000 tons of chromium contaminated soil. The site was placed on the NPL in 1995. Investigation continued through 1999 to further delineate chromium and TCE in groundwater. The extraction network was expanded several times in response to results of additional investigations. In 2001, an additional 2,500 cubic yards (cy) of chromium

contaminated soil was removed from various locations on the Boomsnub site and processed for off-site disposal.

As of July 2003, approximately 21,500 pounds of chromium and 1,945 pounds of TCE have been removed from groundwater since the operation began in 1990. Concentrations within the plumes have decreased significantly over that time period, but still have not reached cleanup goals stated in the ROD.

From 1987 until 1993, remedial activities at the site were performed under the direction of the Washington Department of Ecology. Operations were transferred to the EPA in 1993. The EPA oversaw soil removal activities and expansion of the groundwater pump and treat system to its current capacity. The EPA also oversaw the construction of a gravity sewer line by the responsible party BOC Gases to replace the discharge line that was in use at the facility until 2001. The replacement sewer line allowed for additional capacity for increased treatment system flows or flows from adjacent properties not affiliated with the site. Responsibility for groundwater treatment system operation and maintenance was transferred to BOC Gases in April 2002. EA Engineering Science and Technology Inc. (EA) under contract to BOC Gases, is currently operating and maintaining the groundwater treatment system and designing a volatile organics removal system for source areas on the BOC property. EA will also be responsible for the construction of the volatile organics removal system.

### 3.5 BASIS FOR TAKING ACTION

Hazardous substances that have been released at the site in each media include:

#### **Groundwater:**

Hexavalent chromium  
Chromium (total)  
Bromodichloromethane  
1,2 - Dibromo-3-chloropropane  
Dibromochloromethane  
1,2 - Dichloroethane  
1,1 - Dichloroethane  
Hexachlorobutadiene  
Tetrachloroethene  
1,1,1 - Trichloroethane  
Trichloroethene

#### **Soil:**

Hexavalent chromium  
Chromium (total)  
Bromodichloromethane  
1,2 - Dibromo-3-chloropropane  
Dibromochloromethane  
1,2 - Dichloroethane  
1,1 - Dichloroethane  
Hexachlorobutadiene  
Tetrachloroethene  
1,1,1 - Trichloroethane  
Trichloroethene

Exposure to soil at the site is limited due to extensive soil removal, access restrictions and site institutional controls. Exposure to groundwater within the plume however, is associated with significant human health risks, as concentrations of hazardous substances exceed EPA's risk management criteria for either the average or the reasonable maximum exposure scenarios.

## **4.0 REMEDIAL ACTIONS**

### **4.1 REMEDY SELECTION**

The Record of Decision (ROD) (EPA February 2000) identifies institutional controls and soil removal for the Boomsnub site and groundwater pump and treat as the site-wide groundwater remedy. Source control on the BOC Gases property is identified in a September 2001 EPA Action Memorandum. Remedial action objectives and remedies for each operable unit (OU) include:

#### ***Boomsnub Soil OU***

- Prevent hexavalent chromium in soil from serving as an uncontrolled, ongoing source of contamination to the downgradient groundwater plume through excavation and off-site disposal of soils through a depth of 15 feet below the ground surface exceeding industrial cleanup criteria. Soil cleanup levels were set at 400mg/kg total chromium (8 mg/kg hexavalent chromium) and 1,000 mg/kg lead.
- Prevent future workers from being exposed to lead and chromium in soils above industrial cleanup standards through institutional controls to prevent soil contamination below 15 feet in depth from being disturbed without appropriate precautions.
- Prevent future residential use of the Boomsnub property through deed restrictions precluding future residential uses of the property.

#### ***Site-wide Groundwater OU***

- Prevent further impacts to the Alluvial aquifer through groundwater pumping to minimize contaminant migration.
- Restore impacted groundwater to drinking water standards (MCLs or MTCA B standards) through groundwater treatment.
- Prevent ingestion of contaminated groundwater above federal and state drinking water standards through completion of an area wide well survey and long term monitoring of groundwater.

- Prevent impacts to the upper Troutdale aquifer and the public drinking water supply by reducing contamination in the Alluvial aquifer.

Cleanup goals for the site-wide Groundwater OU outlined in the ROD are reduction of hexavalent chromium to less than 80 micrograms per liter ( $\mu\text{g/L}$ ), total chromium to less than 100  $\mu\text{g/L}$  and reduction of TCE to less than 5  $\mu\text{g/L}$ . Goals have been set for other chemicals as well. The area of attainment for which these remediation goals apply are throughout the groundwater plume in the Alluvial aquifer and at wells installed in the Upper Troutdale formation.

### ***BOC Gases OU***

The BOC Gases OU is being addressed under a September 2001 Action Memorandum. RAOs were not established for the BOC Gases Soil OU. The scope of activities at the BOC Gases facility is focused on a source control measure to prevent VOCs in groundwater from continuing to migrate off the property. In-situ well stripping and soil vapor extraction have been identified for source control for the BOC Gases OU. The remedy for the Site-wide Groundwater OU assumes implementation of, and is compatible with, the in situ well stripping/soil vapor extraction alternative identified for source control at the BOC Gases Soil OU.

#### **4.1.1 Remedy Implementation**

Chromium and lead contaminated soil to depths of less than 15 feet below the ground surface that served as a source of chromium contamination to groundwater was removed from the Boomsnub site during removal actions completed in 1998 and in 2001. Given site access restrictions and future land use restrictions, the contaminated soils remaining on the site do not present a risk to site works or the public.

The Boomsnub groundwater extraction and treatment system has been operational since 1990. The system is designed to operate continuously with minimal operator supervision and is composed of the following elements:

- A groundwater monitoring well network to monitor groundwater quality and extraction system effectiveness;
- A groundwater extraction well network to collect contaminated groundwater for treatment;
- An ion exchange system to remove chromium from extracted groundwater; and

- An air stripper system to remove trichloroethene (TCE) and other volatile contaminants from groundwater.

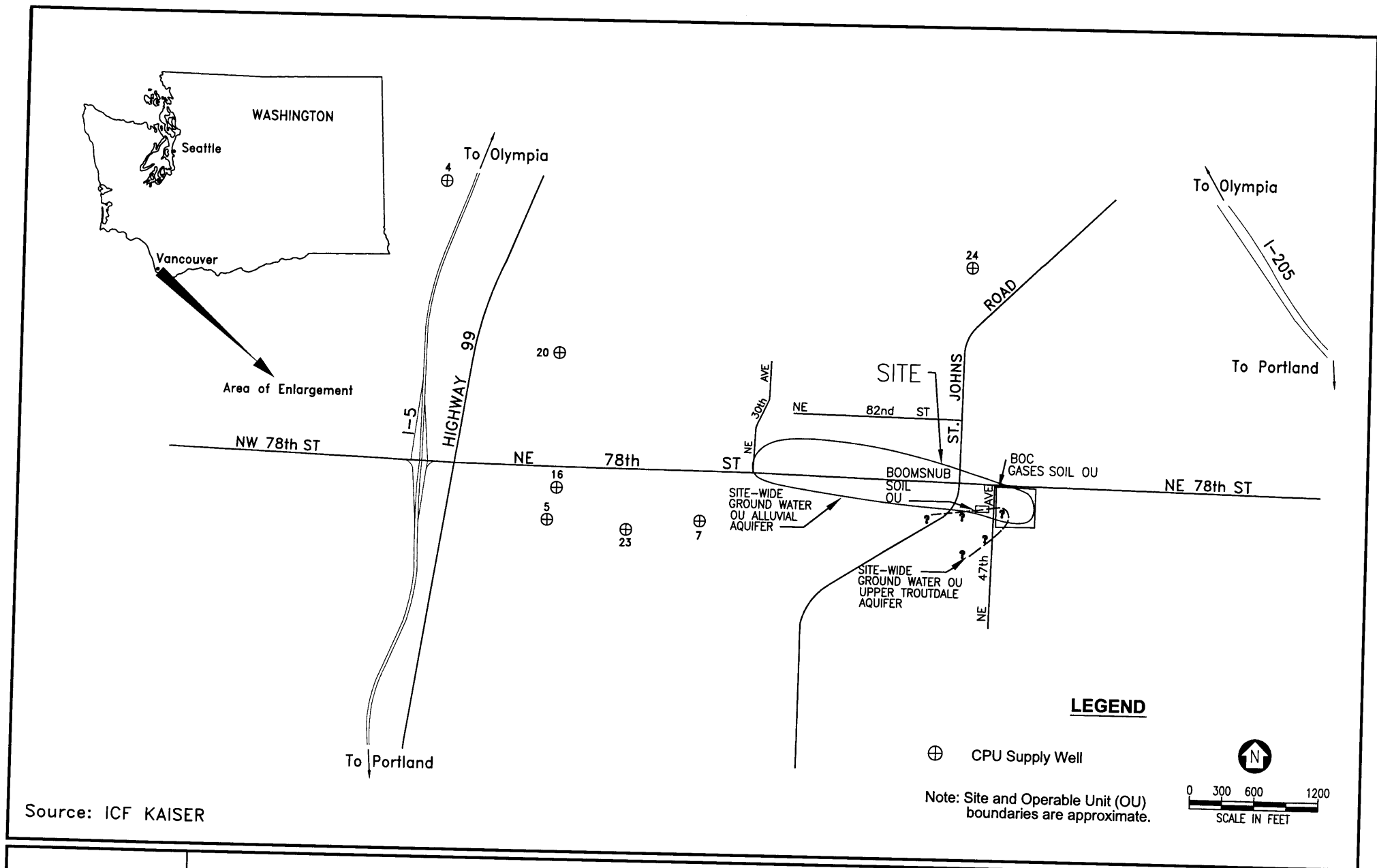
Over 85 groundwater monitoring wells have been installed at the site to define the extent of groundwater contamination. Twenty-four extraction wells remove contaminated groundwater from the Alluvial aquifer for treatment (Figure 2). The groundwater treatment process is illustrated in Figure 3. Groundwater is first treated for chromium using an ion-exchange process and then treated for volatile organics via air stripping. Air stripping off-gases are treated with carbon and released to the atmosphere. Treated groundwater is discharged to the City of Vancouver sanitary sewer system. The current system flow rate is approximately 150 gallons per minute (gpm) with individual well rates ranging from 1 gpm to 15 gpm. The ROD stipulates a total pumping rate of 200 gpm; modeling is currently being performed to determine if increasing the pumping rate to 200 gpm will substantially accelerate groundwater cleanup.

Groundwater pump and treat continues to be effective at removing chromium and VOCs from groundwater. Cumulative removal of chromium and TCE from groundwater over time is illustrated in Figures 4 and 5. Over 21,500 pounds of chromium and 1,945 pounds of TCE have been removed from groundwater since initiation of the pump and treatment system operation. Concentrations of chromium and TCE within the plume have decreased significantly since initiation of system operation (Figures 6-9). Additional data on contaminant removal is provided in Attachment 1.

In situ well stripping and soil vapor extraction source control measures for the TCE contamination at the BOC Gases Soil OU are currently being implemented. Figure 10 presents a process flow diagram for these technologies. In situ well stripping is an in situ treatment process where air lift pumping is used to move groundwater through a vertical circulation well. The volatile organic constituents dissolved in water are stripped from the groundwater within the well casing by the injected air. The off-gas is recovered for above ground treatment. Water is recirculated back into the aquifer at a different elevation from the intake screen.

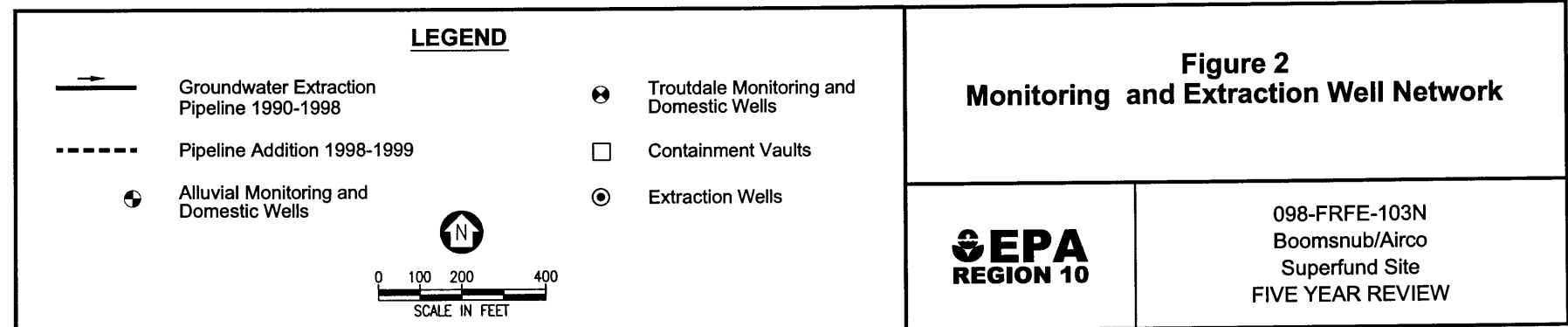
Soil vapor extraction is an in situ soil treatment process where a vacuum is applied to a well screened above the groundwater table to remove air from the soil pore space. Along with the air, volatile organic constituents are extracted. The off-gases are collected and treated before release to the atmosphere.

The in situ well stripping and soil vapor extraction systems are expected to be operational by the end of 2003.

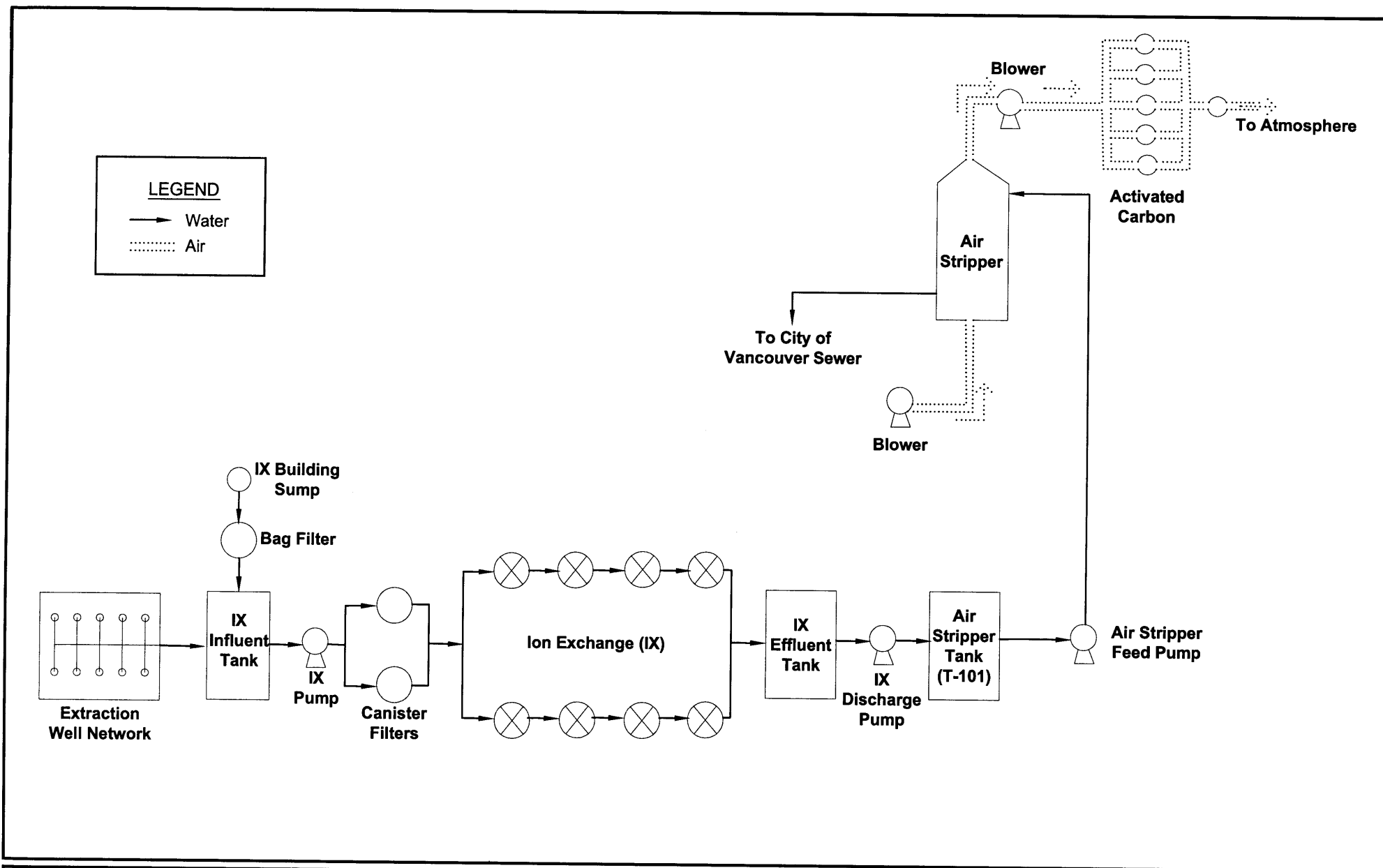


**Figure 1  
Site Location Map**

098-FRFE-103N  
Boomsnub/Airco  
Superfund Site  
FIVE YEAR REVIEW







**Figure 3**  
**Groundwater Treatment**  
**System Flow Diagram**

098-FRFE-103N  
Boomsnub/Airco  
Superfund Site  
FIVE YEAR REVIEW

Figure 4. Cumulative Total Chromium Removal Over Time

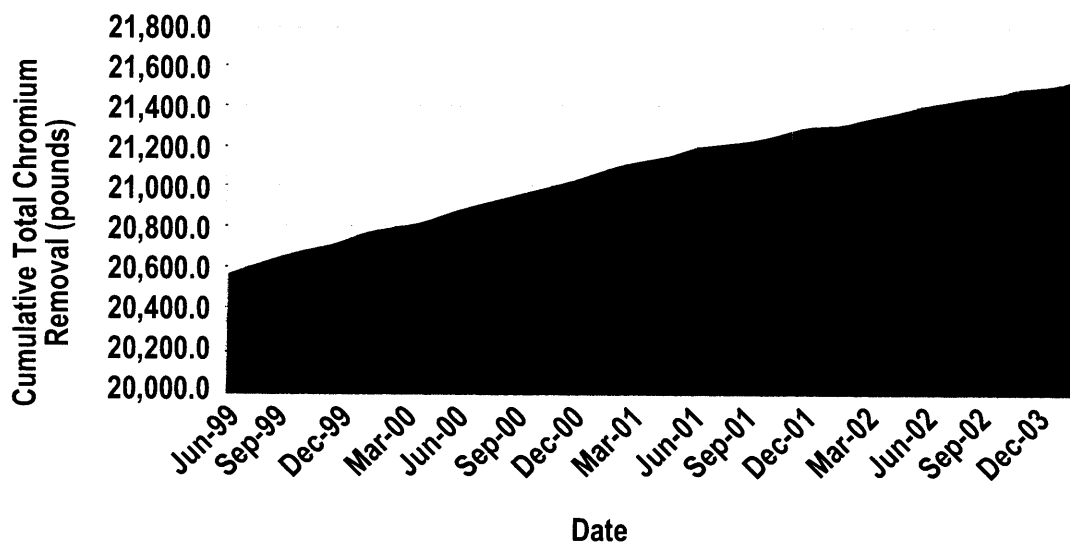
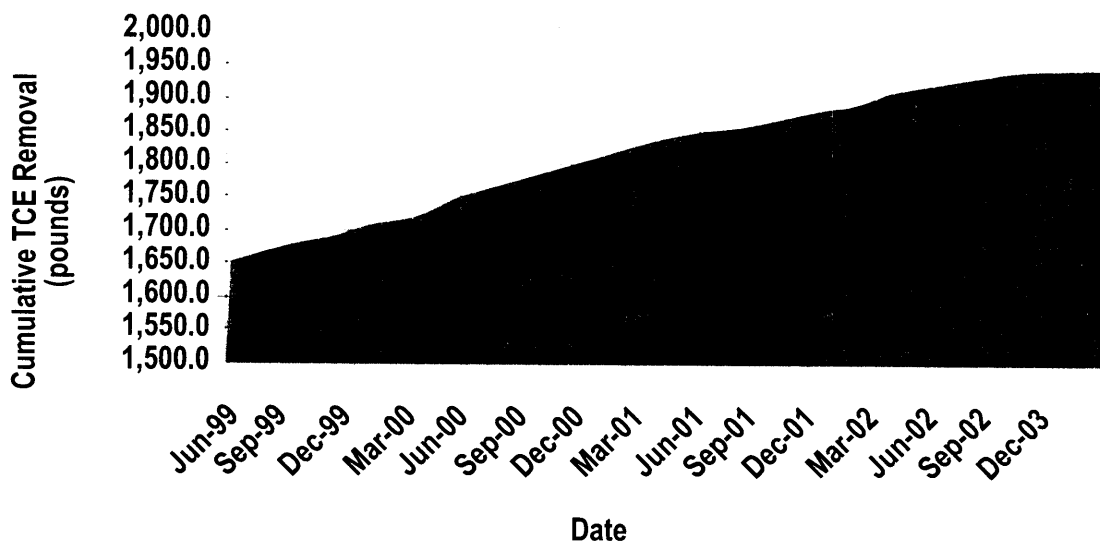
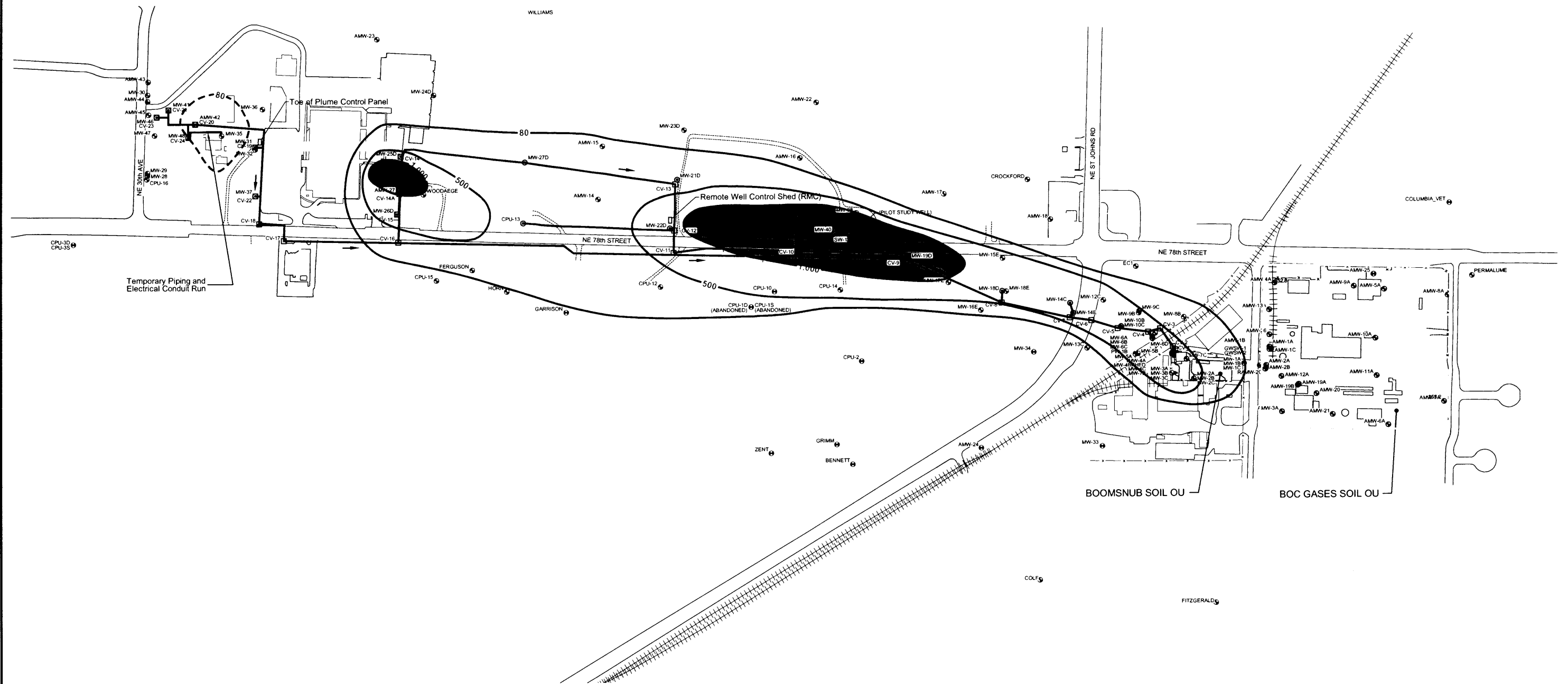


Figure 5. Cumulative Total TCE Removal Over Time

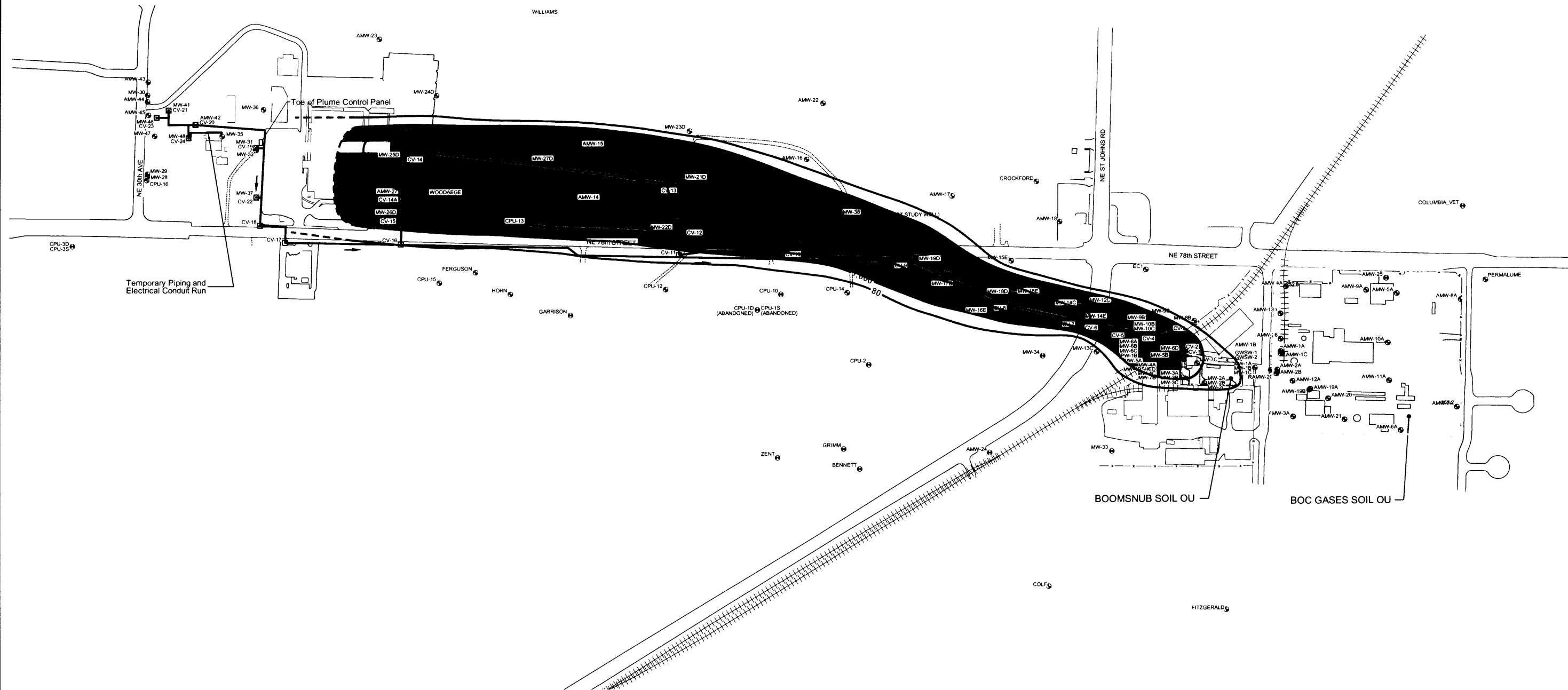




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#### LEGEND

- Groundwater Extraction Pipeline 1990-1998
  - Alluvial Monitoring and Domestic Wells
  - Troutdale Monitoring and Domestic Wells
  - Containment Vaults
  - Extraction Wells
  - Chromium Concentration Contour
- 0 100 200 400  
SCALE IN FEET

Figure 7  
Concentration Contours For  
Chromium in Groundwater  
October 1995

**EPA**  
REGION 10

098-FRFE-103N  
Boomsnub/Airco  
Superfund Site  
FIVE YEAR REVIEW

FILENAME: T:\RAC\Boomsnub\Sub-Tasks\5yr Review\FIG 8 TCE GW 95.dwg  
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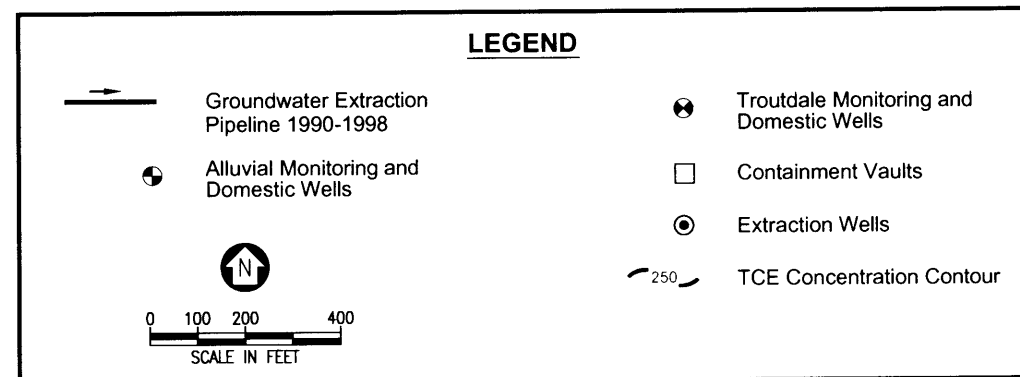
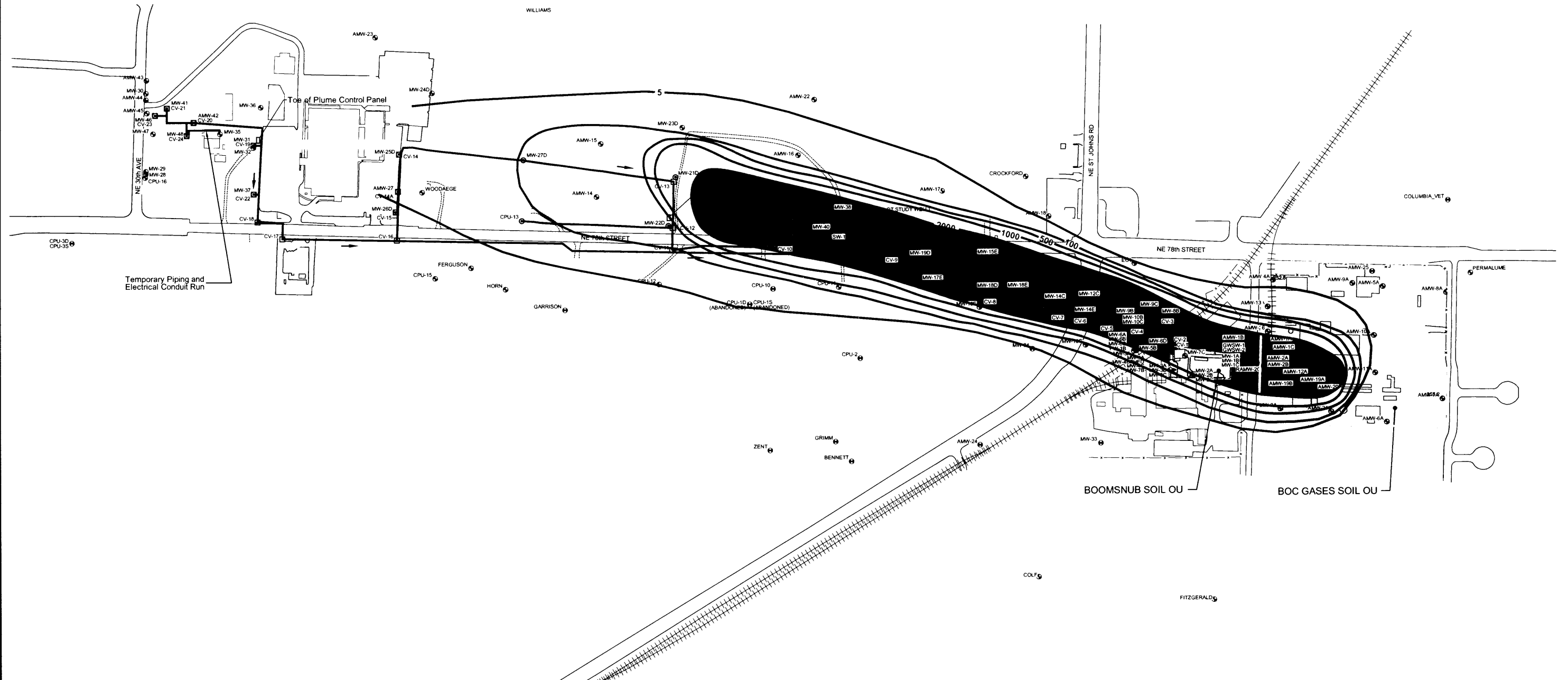
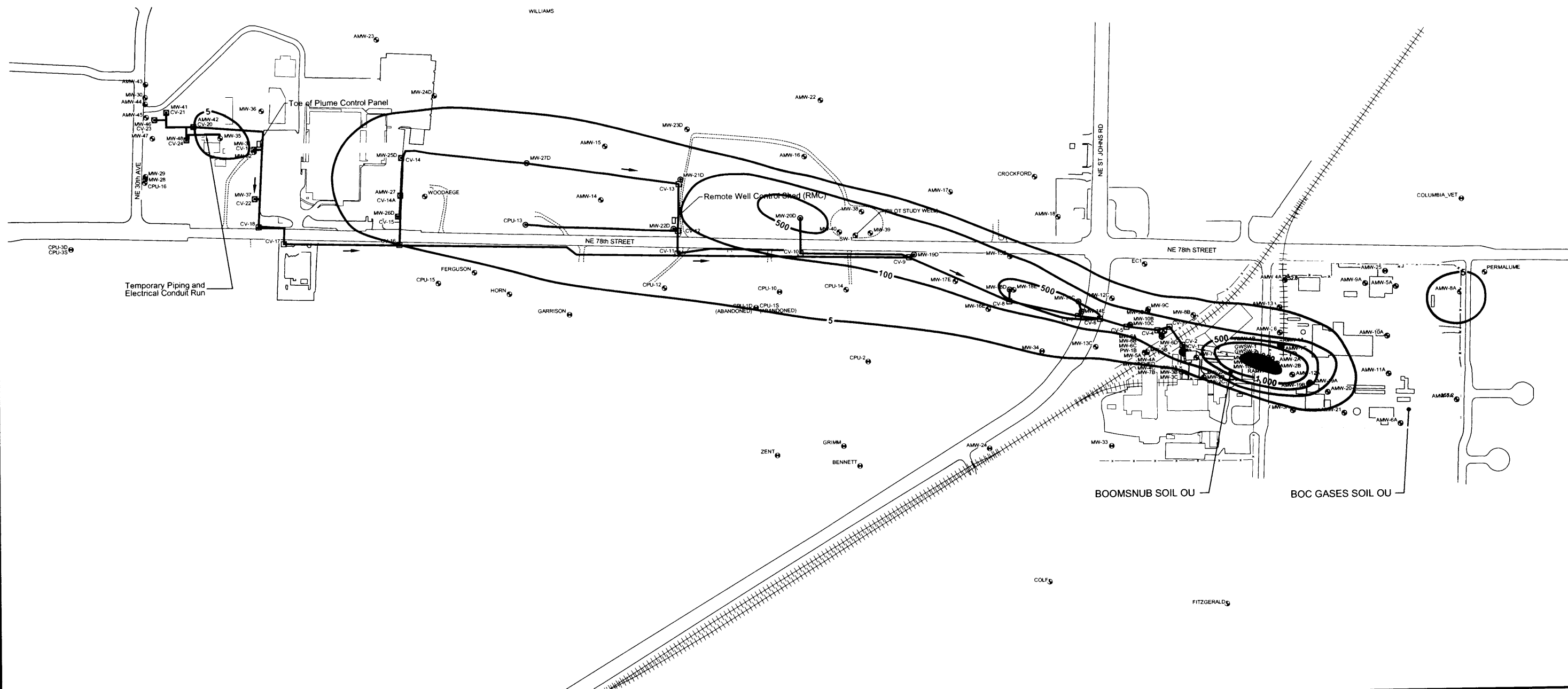


Figure 8  
Concentration Contours For  
TCE in Groundwater  
October 1995

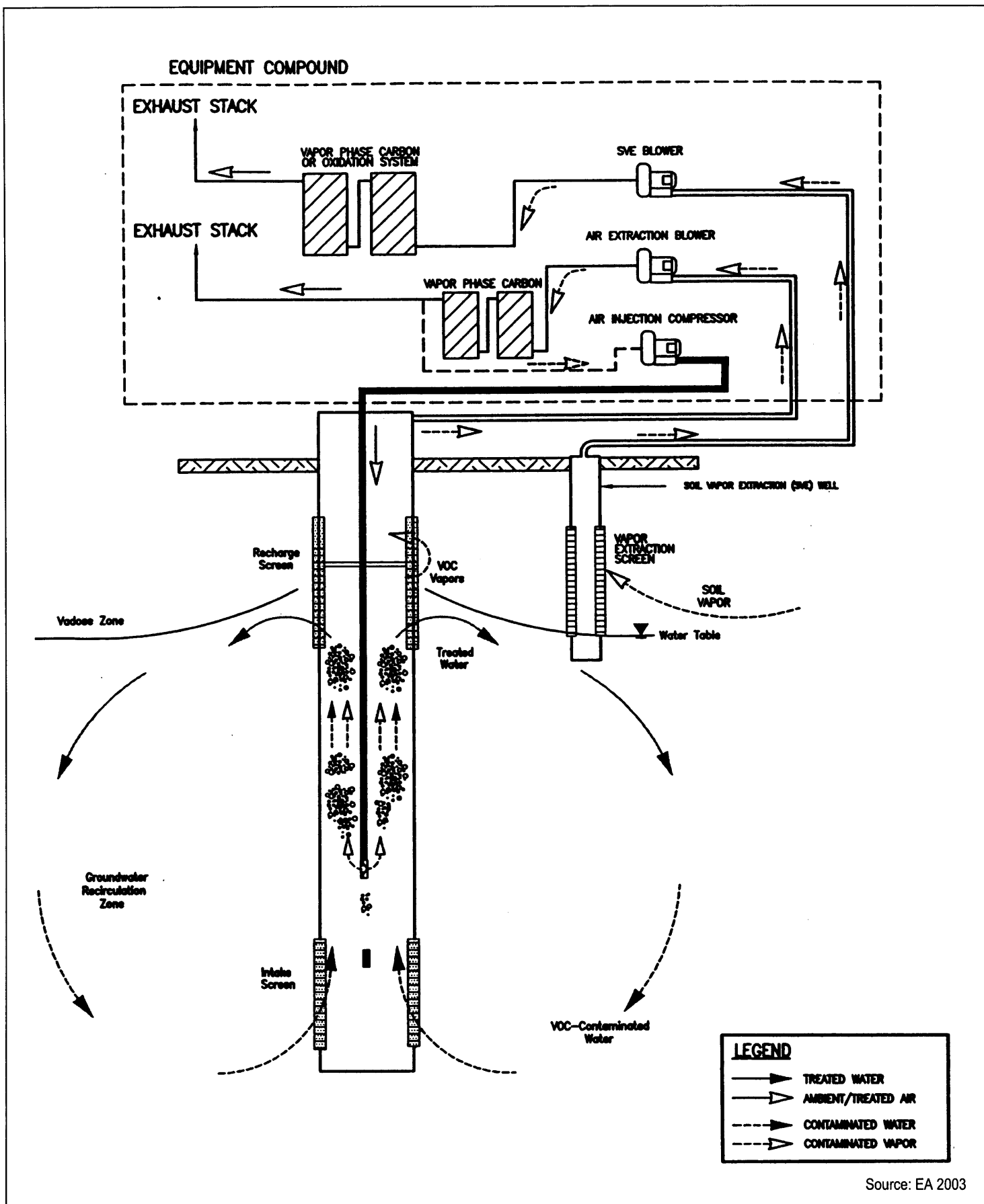


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Source: ICF KAISER



<p><b>LEGEND</b></p> <p>→ Groundwater Extraction Pipeline 1990-1998</p> <p>● Alluvial Monitoring and Domestic Wells</p> <p>⊗ Troutdale Monitoring and Domestic Wells</p> <p>□ Containment Vaults</p> <p>⊙ Extraction Wells</p> <p>250 TCE Concentration Contour</p> <p>0 100 200 400 SCALE IN FEET</p>		<p><b>Figure 9</b>  <b>Concentration Contours For</b>  <b>TCE in Groundwater</b>  <b>July 2003</b></p>	
<p><b>EPA</b>  <b>REGION 10</b></p>		<p>098-FRFE-103N          Boomsnub/Airco          Superfund Site          FIVE YEAR REVIEW</p>	



Source: EA 2003

#### **4.1.2 System Operations/O&M**

Operational responsibility for the groundwater pump and that system was transferred from the EPA to BOC Gases in April 2002. The operational strategy for the system has been to limit the potential for the area of contaminated groundwater to spread beyond the westernmost edge of the contaminant plume while maximizing contaminant mass removal. Measures such as installation of additional groundwater extraction wells, increasing the volume of groundwater extracted and treated, and optimizing pumping have been successful in accomplishing the operational strategy.

Operational costs have averaged roughly \$787,000 per year as outlined in Table 4-1. Total operational costs for remedy implementation including soil removal is approximately \$4,912,000.



**Table 4-1**  
**Annual Average System Operations/O&M Costs**

<b>Activity</b>	<b>Cost/Year</b>
Project Management	\$ 18,000
Monthly Reporting	\$ 36,000
Routine Maintenance	\$179,000
Semiannual Sampling	\$174,000
Data Management	\$ 42,000
Chemical Analysis (routine monitoring)	\$ 24,000
Electricity	\$ 18,000
Treated Water Disposal	\$267,000
Carbon Regeneration	\$ 10,000
Ion Exchange Resin	<u>\$ 19,200</u>
Annual Operating Costs	\$787,200

## **5.0 PROGRESS SINCE THE LAST REVIEW**

This is the first five-year review for this site

## **6.0 FIVE-YEAR REVIEW PROCESS**

### **6.1 ADMINISTRATIVE COMPONENTS OF THE FIVE-YEAR REVIEW PROCESS**

Members of the community were notified of the initiation of the five-year review on June 18, 2003. The Boomsnub/Airco Five-Year Review team was led by Lee Marshall EPA, Remedial Project Manager (RPM) for the Boomsnub/Airco site and included EPA hydrogeologist Bernie Zavala.

In July 2003 the review team established the review schedule whose components included:

- Community Involvement;
- Document Review;
- Data Review;
- Site Inspection;
- Local Interviews; and
- Five-Year Review Report Development and Review.

### **6.2 COMMUNITY NOTIFICATION AND INVOLVEMENT**

Community involvement has been an on-going part of remediation activities at the Site. A number of EPA fact sheets have been developed and distributed to nearby property owners and residents. In addition, public meetings have been periodically held to update the general public on the status of site activities. Owners of property on which EPA extraction/monitoring wells are located also receive data from routine groundwater sampling events.

As part of this review, a notice was sent to local newspapers that a five-year review was to be conducted. A fact sheet was also developed for distribution to the concerned citizens, nearby property owners and residents, and the general public. The fact sheet and newspaper notice invited public comment on the five year review process and any site-related issues. No comments or questions were received from the general public.

Interviews were completed with nearby property owners and interested parties. The purpose of the interviews was to identify issues and concerns related to the implementation and on-going operation of the site remedy.

### **6.3 DOCUMENT REVIEW**

The five-year review consisted of a review of relevant documents including O&M records and monitoring data (Attachment 2). Applicable groundwater cleanup standards, as listed in the ROD, were reviewed (See Attachment 3).

### **6.4 DATA REVIEW**

Soil excavation and off-site disposal has been completed on the Boomsnub property in areas of the site where soils contamination was observed at depths of less than 15 feet below the ground surface. Confirmation sampling following soil removals indicates that readily excavated chromium and lead contaminated soil that presented unacceptable risks to human health and served as a source of groundwater contamination has been removed from the site. Small areas of shallow contaminated soil are present under treatment system buildings and paved areas of the site. As long as the treatment system buildings and paving remain in place, these soils, because they are under cover, do not present a risk to site workers or those at or near the site.

Groundwater monitoring has been conducted at the site to evaluate the effectiveness of the remedy with regard to preventing further migration of contamination to the west in the Alluvial aquifer (downgradient edge) and limiting the migration of contamination from the Alluvial aquifer to the Upper Troutdale formation. Data indicate that the downgradient edge of the plume has been delineated and the plume is appropriately contained in the downgradient direction. With regard to the contaminant migration from the Alluvial aquifer to the Troutdale, volatile organics have been detected in the Troutdale formation, albeit at concentrations below ROD specified cleanup levels that do not present a risk to water users. Additional monitoring wells were installed in the Troutdale in the summer of 2002 and modeling efforts are currently being completed to evaluate the potential for further contamination of the Troutdale formation.

### **6.5 SITE INSPECTION**

A site inspection was conducted on July 17, 2003. The purpose of the inspection was to review system operations and evaluate whether site controls adequately protect human health. The site inspection summary report is provided in Attachment 4. Photographic documentation of system components was also collected and is provided as Attachment 5.

Since initiation of operation, The system remained operational 94 to 99% of the time and maintained contaminant removal efficiencies of over 95%. Routine system monitoring and preventive maintenance ensures optimal system operational efficiencies and minimizes system downtime.

The system was fully operational at the time of the inspection. Seventeen of the 24 extraction wells were in operation with an extraction rate of approximately 150 gpm. The system has been operating in compliance with permit conditions. No major system failures were reported. Minor system problems or adjustments are addressed through routine system maintenance activities.

A number of routine maintenance activities are regularly performed. Site improvement activities including painting and facility repair have also been completed.

## 6.6 INTERVIEWS

Interviews were performed either by telephone or thorough face to face meetings. Parties were identified for the interviews based on the following criteria:

- Parties adjacent to the site or effected by site related contaminants
- Public entities/utilities effected by operation of the remedy
- Interested and concerned citizens or citizen groups.

Parties identified for interviews included:

Steve Prather	Clark County Public Utilities
Dotti Ramey, P.E.	City of Vancouver
Dan Huevel	Adjacent Property Owner
Wayne Amondson	Church of God (effected property) Business Administrator
Doug Ballou	NE Hazel Dell Neighborhood Association
Denise Anderson	Clark County Hazardous Waste Citizen's Task Force
Sandy Brackin	GL&V Cellico Adjacent Property
Sean McNamee	Speeds Towing Adjacent Property

Attempts to contact GL&V Cellico and Speeds Towing were unsuccessful; representatives of these adjacent properties were therefore not interviewed. Interview summaries are provided as Attachment 6. Interviews included a review of activities completed to date at the site, site operational status, planned activities and issues/concerns with system operation. Overall, interviewees expressed few concerns with regard to system operation and appreciated the opportunity to be included in the five-year review process. The principal concern identified was related to the potential for site related constituents to enter regional groundwater supplies and the impact of site and associated remedy components (wells, pipelines, electrical controls) on the increasing levels of land development in the vicinity of the site.

## **7.0 TECHNICAL ASSESSMENT**

### **7.1 QUESTION A: IS THE REMEDY FUNCTIONING AS INTENDED BY THE DECISION DOCUMENTS?**

#### **7.1.1 Remedial Action Performance**

Confirmation sampling following soil removals indicates that readily excavated chromium and lead contaminated soil through a depth of 15 feet below the ground surface that presented risks to site workers, precluded industrial use of the property and served as a source of chromium contamination to groundwater, has been removed from the Boomsnub site. Site access restrictions to the Boomsnub property prevent soil contamination below 15 feet in depth from being disturbed without appropriate precautions.

Small areas of contaminated soil are present at depths of less than 15 feet below the ground surface under treatment system buildings and paved areas of the site. As long as the treatment system buildings and paving remain in place, these soils, because they are under cover, do not present a risk to site workers or those at or near the site or serve as a source of chromium contamination of groundwater. Removal of these soils, if necessary, will be performed upon decommissioning, demolition and removal of the treatment plant and associated facilities.

Long-term compliance monitoring for contaminated groundwater is performed to assess the operational efficiency and monitor groundwater contaminant migration. Monitoring has indicated that groundwater pump and treatment has minimized the migration of and prevented exposure to, or ingestion of, contaminants in groundwater, as well as limited contaminant migration into the Troutdale aquifer. In addition, construction of TCE source mitigation measures (BOC Gases OU) is currently being planned to eliminate sources of TCE contamination.

#### **7.1.2 System Operations/O&M**

Operation and maintenance of the pump and treat system has, on the whole, been effective. Since initiation of operation the system remained operational 94 to 99% of the time and maintained contaminant removal efficiencies of over 95%. The system is continuously monitored and is designed to alert system operators to system malfunctions. Response time for system malfunctions is generally within two hours; malfunctions have been infrequent and have historically been attributable to extraction or influent/effluent pump breakdown, high levels in process tanks or sumps, and operational malfunctions of system components. A significant number of these malfunctions were attributable to problems with the air stripper. The air

stripping system was therefore replaced in February 2000 and operational malfunctions associated with the air stripper and/or other system components have been limited to those readily addressed through routine system monitoring, preventive maintenance, and spot repairs.

Procedures for system operations and maintenance (O&M) have been detailed in a site-specific O&M manual. These procedures ensure optimal system operational efficiencies and minimize system downtime. Troubleshooting procedures for inoperative system components are also provided in the O&M manual. The O&M manual is continuously updated to address unique situations or operating procedures.

O&M annual costs are consistent with original estimates and there are no indications of any difficulties with the remedy.

### **7.1.3 Opportunities for Optimization**

In February 2002, a team of expert hydrogeologists and engineers independent of the site performed a Remedial System Evaluation (RSE). The RSE provided a third party evaluation of site operations and considered the goals of the remedy, the site conceptual model, aboveground and subsurface performance, and the site exit strategy. It included a review of site documents, a site visit/inspection and development of recommendations for system improvements. Recommendations were provided for the following four categories:

- Improvements in remedy effectiveness
- Reductions in operation and maintenance costs
- Technical improvements and
- Gaining site closeout.

#### ***Improvements in remedy effectiveness***

The RSE identified two major concerns relative to the effectiveness of the remedy: 1) preventing further migration of contamination in the Alluvial aquifer and 2) limiting migration of contamination from the Alluvial aquifer to the Troutdale aquifer. The RSE recommended optimizing the extraction system including modification of the extraction rate and potential reallocation of extraction among the extraction wells to address these concerns. To that end, a hydrogeologic analysis is being performed to estimate the potential for contaminant migration to the upper Troutdale aquifer and to assist in determining pumping rate and schedule for the various groundwater extraction wells.

### ***Reductions in operation and maintenance costs***

The RSE identified significant potential for system operations cost savings if alternative treated water discharge options were used. Currently the system discharges to the sanitary treatment system at a cost of approximately \$22,000/month. ReInjection/reuse of treated water (either all of or a portion of the treated water) would reduce the volume discharged to the sanitary treatment system and therefore the costs associated with water disposal.

ReInjection/water reuse scenarios are currently being evaluated. The hydrogeologic analysis being performed will provide information necessary to evaluate the feasibility of reinjecting treated groundwater into the Alluvial aquifer.

### ***Technical improvements***

Minor system improvements including elimination of the effluent tank and pump from the system and electrical improvements in the vicinity of the air stripper were recommended by the RSE. These recommendations have been implemented.

### ***Gaining site closeout***

The RSE recognized that at some point in the future contaminant mass removal rates will decline, influent contaminant concentrations will plateau and progress toward site restoration will plateau and recommended identification and evaluation of measures to continually assess the effectiveness of the remedy. In addition, the RSE suggested that it may be necessary to augment the existing remedy with other contaminant removal measures in the future.

The implementation of the in-well stripping system planned on the BOC Gases property will augment pump and treat for removal of volatile organics from site groundwater. In-well stripping removes volatiles from groundwater by injecting air below the groundwater surface within a well and stripping volatile contaminants from groundwater into a vapor or gaseous phase. This vapor or gas is removed from the well with a vacuum system and is subsequently treated and released to the atmosphere. Volatile organics in soils on the BOC Gases property will be removed through operation of the soil vapor extraction system.

### **7.1.4 Early Indicators of Potential Issues**

Operations of the groundwater extraction and treatment system are monitored on a regular basis. Monitoring includes groundwater sampling and analyses and evaluation of groundwater contamination trends and system sampling to verify contaminant removal effectiveness and efficiency. The extent of monitoring performed provides information necessary for identification



of potential issues relating to on-going remediation efforts. Currently there are no indications that groundwater contamination is increasing or migrating beyond established areas of control. Monitoring of the Troutdale aquifer however has indicated that low-level concentrations of volatile organic compounds below ROD cleanup criteria are present in groundwater in the Troutdale. Additional monitoring wells have been installed in the Troutdale to effectively monitor potential migration of contamination in the Troutdale and provide a means of identifying whether site-related contamination will impact regional drinking water supplies.

### **7.1.5 Implementation of Institutional Controls and Other Measures**

Institutional controls include deed restrictions and controlled site access for the Boomsnub property to prevent soil contamination below 15 feet in depth from being disturbed without appropriate precautions and preclude residential use of the Boomsnub property. Long-term compliance monitoring for contaminated groundwater is also required to assess the operational efficiency and monitor groundwater contaminant migration.

No activities were observed that compromise institutional controls. It was determined, however, that deed restrictions precluding residential use have not been formally recorded for the Boomsnub property. The EPA will take the necessary steps to appropriately record site deed restrictions. In the interim, residential use of the property is precluded by site access restrictions and the operation of the groundwater pump and treat system.

## **7.2 QUESTION B: ARE THE EXPOSURE ASSUMPTIONS, TOXICITY DATA, CLEANUP LEVELS, AND REMEDIAL ACTION OBJECTIVES (RAOS) USED AT THE TIME OF REMEDY SELECTION STILL VALID?**

### **7.2.1 Changes in Standards and TBCs**

There have been no changes in standards or TBCs that effect the protectiveness of the remedy. Institutional controls prevent soil contamination below 15 feet in depth from being disturbed without appropriate precautions and preclude residential use of the Boomsnub property. Groundwater pumping prevents further impacts to the Alluvial aquifer and minimizes contaminant migration potential. Groundwater treatment restores impacted groundwater to drinking water standards and the potential for ingestion of contaminated groundwater above federal and state drinking water standards is eliminated through long term monitoring of groundwater. Long-term compliance monitoring for contaminated groundwater also ensures treatment system operational efficiency and compliance with applicable discharge permits and provides data necessary for evaluation of the potential for further groundwater contaminant migration.

While there have been no changes to standards or TBCs, there have been changes to Washington state regulations associated with waste disposal and hazardous waste site assessment and cleanup. Specifically, Solid Waste Handling Standards have been promulgated in lieu of the Minimum Functional Standards for Solid Waste Handling and the Washington State Model Toxics Cleanup Act (MTCA) regulations[ WAC173-340] have been revised. The Solid Waste Handling Standards govern solid waste disposal and are operationally significant to disposal of non-hazardous solid waste materials from the site. MTCA revisions include a change in the toxicity determination of TCE, a reduction in the groundwater cleanup level for chromium, and more stringent MTCA Method B groundwater cleanup criteria. MTCA revisions also stipulate risk-based analyses to evaluate the potential soils to groundwater contaminant migration pathway. MTCA revisions do not effect soils remediation that has been performed, site institutional controls or groundwater treatment requirements.

### **7.2.2 Changes in Exposure Pathways**

Principal exposure pathways for site-related contaminants include groundwater ingestion and dermal contact with contaminated soils. Groundwater well surveys have been conducted in the vicinity of the site; contaminated groundwater in the vicinity of the site is not known to be used as drinking water by area residents or businesses. Similarly institutional controls and site access restrictions prevent soil contamination below 15 feet in depth from being disturbed without appropriate precautions and preclude residential use of the Boomsnub property. Small areas of contaminated soil are present at depths of less than 15 feet below the ground surface under treatment system buildings and paved areas of the site. As long as the treatment system buildings and paving remain in place, these soils, because they are under cover, do not present a risk to site workers or those at or near the site or serve as a source of chromium contamination of groundwater.

### **7.2.3 Changes in Toxicity and Other Contaminant Characteristics**

Data has recently become available relative to the toxicity of TCE. In response to this data, the EPA revised the process for determining risk associated with TCE exposure. Based on this revision, the estimated human health risk at the site for the groundwater ingestion pathway under the selected cleanup remedy has potentially increased (i.e., the calculated excess cancer risk has changed from  $1.26 \times 10^{-6}$  to  $4.5 \times 10^{-5}$ ). However, the recalculated risk from groundwater ingestion is still within EPA's range of acceptable risk. This, when considering that groundwater is not a current source of drinking water, indicates that the TCE cleanup level established in the ROD (5 µg/L the MCL) is still sufficiently protective of human health.

#### **7.2.4 Changes in Risk Assessment Methods**

There have been no changes in EPA's risk assessment methods that impact the protectiveness of the remedy.

#### **7.2.5 Expected Progress in Meeting RAOs**

Institutional controls prevent soil contamination below 15 feet in depth from being disturbed without appropriate precautions and preclude residential use of the Boomsnub property. Small areas of contaminated soil are present at depths of less than 15 feet below the ground surface under treatment system buildings and paved areas of the site. As long as the treatment system buildings and paving remain in place, these soils, because they are under cover, do not present a risk to site workers or those at or near the site or serve as a source of chromium contamination of groundwater. Removal of these soils, if necessary, will be performed upon decommissioning, demolition and removal of the treatment plant and associated facilities.

Groundwater pump and treatment has minimized the migration of and prevented exposure to, or ingestion of, contaminants in groundwater, as well as limited contaminant migration into the Troutdale aquifer. In addition construction of TCE mitigation measures is currently being planned to eliminate sources of TCE contamination.

### **7.3 QUESTION C: HAS ANY OTHER INFORMATION COME TO LIGHT THAT COULD CALL INTO QUESTION THE PROTECTIVENESS OF THE REMEDY?**

There have been no changes in the physical conditions of the site that would affect the protectiveness of the remedy. No weather- related or naturally occurring events (earthquakes) have affected the protectiveness of the remedy. Land development of the area of the plume has been coordinated with the EPA such that impacts to remedy operation are minimized. Operation of the pump and treat system has not been impacted by development of properties in the vicinity of the site. There is no other information that calls into question the protectiveness of the remedy.

#### **7.3.1 Technical Assessment Summary**

There is no information that calls into question the protectiveness of the remedy. Institutional controls prevent soil contamination below 15 feet in depth from being disturbed without appropriate precautions and preclude residential use of the Boomsnub property. Small areas of contaminated soil are present at depths of less than 15 feet below the ground surface under treatment system buildings and paved areas of the site. As long as the treatment system buildings and paving remain in place, however, these soils, because they are under cover, do not

present a risk to site workers or those at or near the site or serve as a source of chromium contamination of groundwater. Removal of these soils, if necessary, will be performed upon decommissioning, demolition and removal of the treatment plant and associated facilities.

The groundwater treatment system currently operates at a capacity of approximately 150 gpm. While groundwater treatment criteria are being met, the ROD stipulates operation of the treatment system at 200 gpm. Studies are currently being performed to evaluate increasing the treatment system capacity. These studies include the evaluation of the potential for system pipeline and component hydraulic modifications or addition of treatment capacity (e.g., additional resin canisters) to accommodate increased flows, and groundwater modeling to ascertain the effects of increased groundwater pumping on contaminant removal.

## 8.0 ISSUES

Issues identified in this five year review are summarized in Table 8-1. These issues have limited or no affect on the protectiveness of the remedy in the short term but may effect the long term remedy protectiveness. Of specific importance is the uncertainty regarding the ability of groundwater pump and treat to achieve cleanup levels identified in the ROD and minimize the potential for contaminant migration to the Troutdale aquifer. At some time in the future contaminant mass removal rates will decline, treatment system influent concentrations will plateau and progress toward site restoration will slow. At that time alternative treatment methods may be necessary.

Previously evaluated technologies included passive technologies such as permeable reactive barrier wall. This technology was not found to be cost effective and would not mitigate the potential for contaminant migration to the Upper Troutdale aquifer (offers only horizontal control). Results of groundwater modeling may be useful in predicting when pump and treat is no longer cost effective. At that time promising emerging groundwater treatment technologies may have matured to the point of full scale applicability.

**Table 8-1**  
**Issues Identified During Five Year Review**

Issue	Affects Protectiveness Y/N	
	Current	Future
Deed restrictions for the Boomsnub property to limit future use of the property have not been formally recorded	N	Y
Limited volumes of contaminated soil above ROD specified cleanup levels remain on the site at depths of less than 15 feet below the ground surface in the vicinity of the groundwater treatment facilities.	N	Y
The ROD specified treatment system capacity of 200 gallons per minute has not been achieved; increasing capacity to 200 gallons per minute may be limited by system components.	?	?
BOC Gases Soil OU remedy remains to be implemented	N	Y
Uncertainty exists with regard to the long term ability of the remedy to remain protective of drinking water supplies in the area.	N	Y
Significant opportunities including alternate discharge options and system modifications may exist to reduce operational costs of remedy implementation.	N	N
Regional development needs to be coordinated with site activities to minimize the impacts of development on system components and operations.	N	?

## 9.0 RECOMMENDATIONS AND FOLLOW-UP ACTIONS

Followup actions include completion of groundwater modeling to determine appropriate pumping rate, evaluation and implementation of alternative treated water discharge options and implementation of the BOC Gases Soil OU remedy. These actions are summarized in Table 9-1.

**Table 9-1**  
**Recommendations and Follow-up Actions**

Issue	Recommendations and Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness (Y/N)	
					Current	Future
Deed restrictions for the Boomsnub property to limit future use of the property have not been formally recorded	Record Deed restrictions	EPA		December 2004	N	Y
Limited volumes of contaminated soil above ROD specified cleanup levels remain on the site at depths of less than 15 feet below the ground surface in the vicinity of the groundwater treatment facilities.	Upon decommissioning, demolition and removal of treatment facilities remove contaminated soil through a depth of 15 feet to allow industrial use of property	EPA	EPA	December 2005	N	Y

**Table 9-1 (Continued)**  
**Recommendations and Follow-up Actions**

Issue	Recommendations and Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness (Y/N)	
					Current	Future
The ROD specified treatment system capacity of 200 gallons per minute has not been achieved; increasing capacity to 200 gallons per minute may be limited by system components.	Perform hydrogeologic modeling to assess effects of increased pumping on contaminant removal	BOC Gases	EPA	June 2004	N	Y
	Perform system hydraulic assessment to appropriately modify system components for increased capacity	BOC Gases	EPA	December 2004	N	Y
Uncertainty exists with regard to the long term ability of the remedy to remain protective of drinking water supplies in the area.	Perform hydrogeologic modeling to assess long term viability of remedy	BOC Gases	EPA	December 2004	N	Y
	Modeling of contaminant migration potential from the Alluvial aquifer to the Troutdale aquifer should be performed. Groundwater monitoring of the Troutdale aquifer should also continue.	BOC Gases	EPA	December 2004	N	Y
BOC Gases OU remedy remains to be implemented	Designs have been completed and construction is scheduled for the implementation of the BOC Gases Soil OU remedy.	BOC Gases	EPA	December 2003	N	Y

**Table 9-1 (Continued)**  
**Recommendations and Follow-up Actions**

Issue	Recommendations and Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness (Y/N)	
					Current	Future
Significant opportunities including alternate discharge options and system modifications, may exist to reduce operational costs of remedy	Fully evaluate and implement alternative system discharge options	BOC Gases	EPA	December 2004	N	N
Regional development needs to be coordinated to with site activities minimize the impacts of development on system components and operations.	Monitor regional development and assess impacts of development to remedy protectiveness and operation	BOC Gases	EPA	On going	N	Y



## **10.0 PROTECTIVENESS STATEMENT(S)**

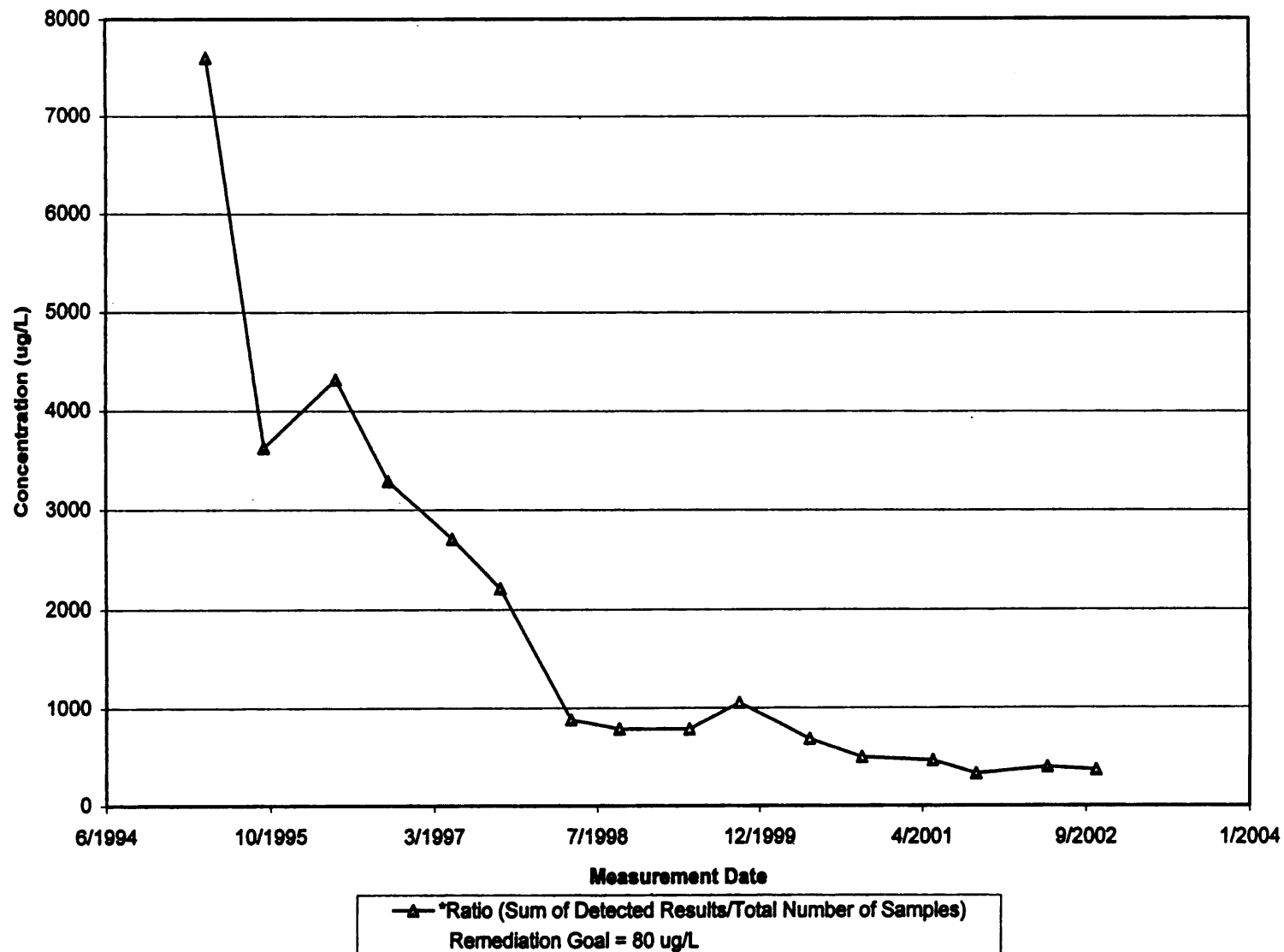
The remedy at the Boomsnub/Airco Superfund Site is expected to be protective of human health and the environment upon completion and in the interim, exposure pathways that could result in unacceptable risks are being controlled.

## **11.0 NEXT REVIEW**

The next five-year review for the Boomsnub/Airco Superfund Site is required by September 2008, five years from the date of this review.

**ATTACHMENT 1**

**Groundwater Trends**



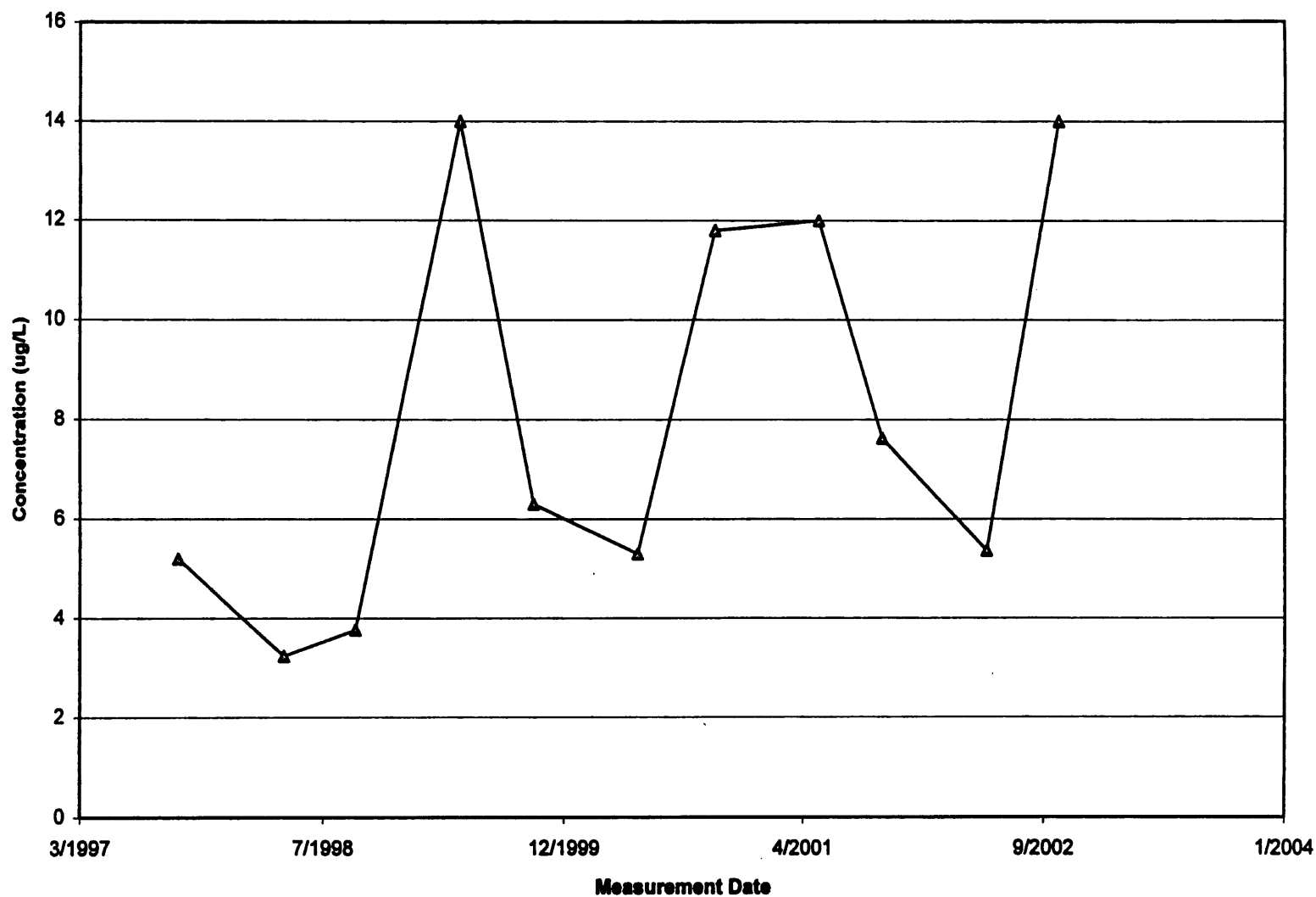
\*The sum includes only semiannual sampling events and does not include non-detect results or duplicate sample results. The graph is for illustrative purposes only and shows the general concentration trend over time.

Source: EA 2003



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Boomsnub/ARCO Superfund Site  
FIVE YEAR REVIEW

Overall Trend of Chromium Concentrations in Groundwater Samples - Alluvial Aquifer



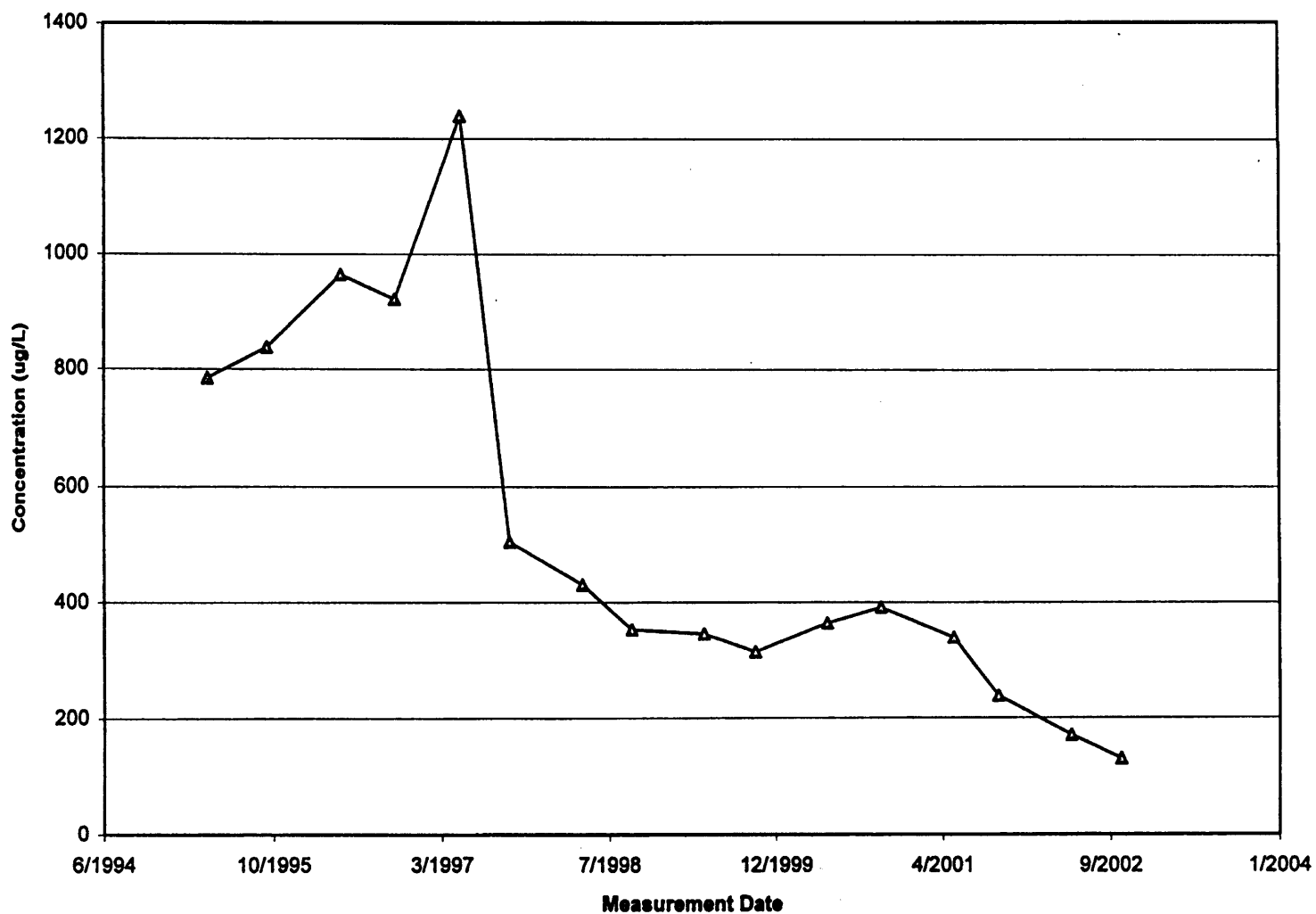
\*The sum includes only semiannual sampling events and does not include non-detect results or duplicate sample results. The graph is for illustrative purposes only and shows the general concentration trend over time.

Source: EA 2003



098-FR-FE-103N  
Boomsnub/ARCO Superfund Site  
FIVE YEAR REVIEW

Overall Trend of Chromium Concentrations in Groundwater Samples - Troutdale Aquifer



—▲\*Ratio (Sum of Detected Results/Total Number of Samples)  
Remediation Goal = 5 ug/L

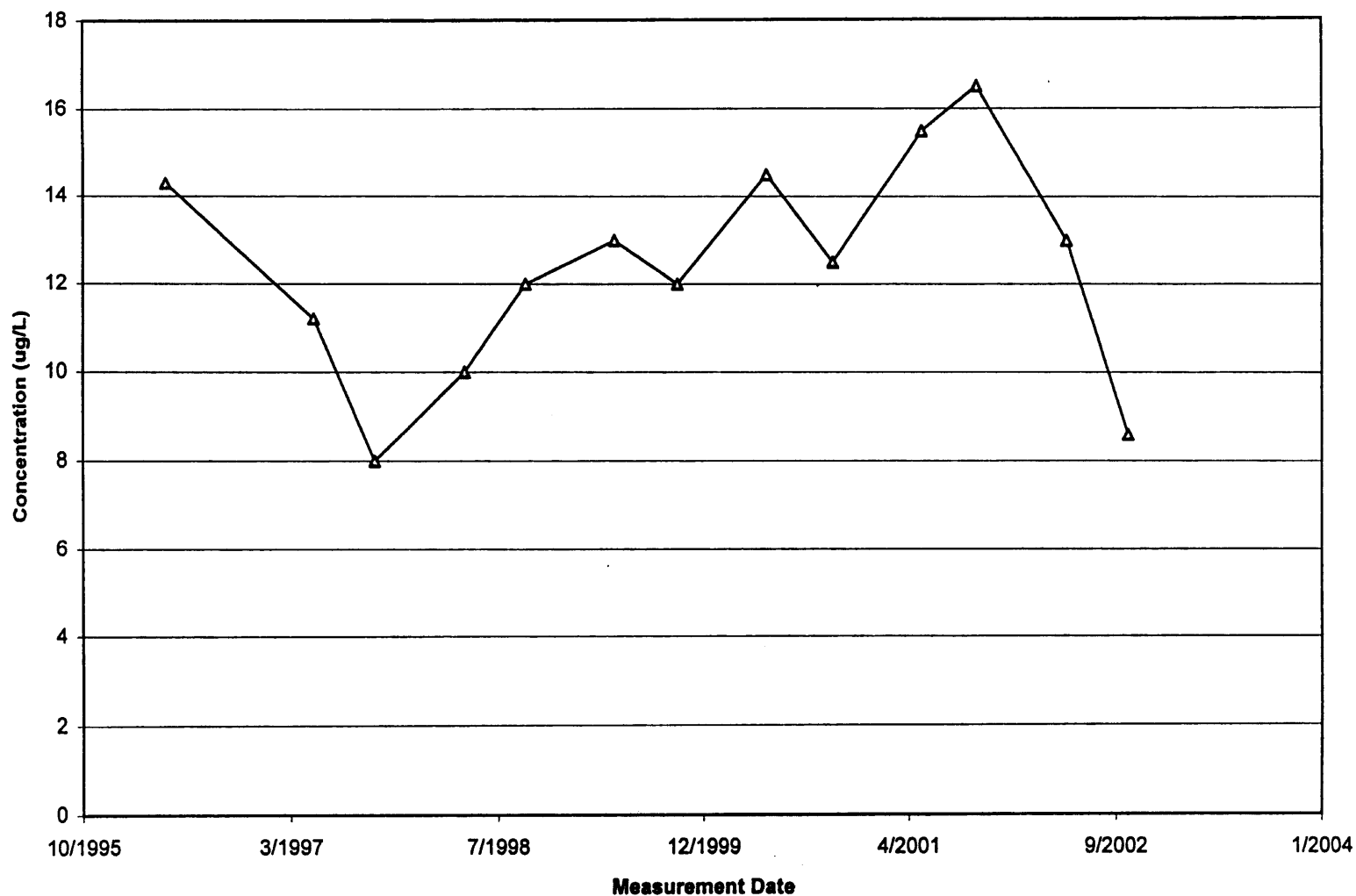
\*The sum includes only semiannual sampling events and does not include non-detect results or duplicate sample results. The graph is for illustrative purposes only and shows the general concentration trend over time.

Source: EA 2003



098-FR-FE-103N  
Boomsnub/ARCO Superfund Site  
FIVE YEAR REVIEW

Overall Trend of Trichloroethene in Groundwater Samples - Alluvial Aquifer



\*The sum includes only semiannual sampling events and does not include non-detect results or duplicate sample results. The graph is for illustrative purposes only and shows the general trend over time.

Source: EA 2003



098-FR-FE-103N  
Boomsnub/ARCO Superfund Site  
FIVE YEAR REVIEW

Overall Trend of Trichloroethene in Groundwater Samples - Troutdale

## **ATTACHMENT 2**

### **List of Documents Reviewed**



## **LIST OF DOCUMENTS REVIEWED**

EA Engineering Science and Technology Inc., 2003. 2002 Annual Status Report for the Boomsnub/Airco Superfund Site Hazel Dell, Washington. Prepared for BOC Gases, Murray Hill, NJ.

EA Engineering Science and Technology Inc., 2000a. Final Engineering Evaluation/Cost Analysis BOC Gases Vancouver Washington.

EA Engineering Science and Technology Inc., 2000b. Final Phase II Site Evaluation Report BOC Gases Vancouver Washington.

GeoTrans Inc., 2002. Report of the Remediation System Evaluation Site visit conducted at the Boomsnub/Airco Superfund Site, February 26-27, 2002. Prepared for the USEPA Technology Innovation Office and Office of Emergency and Remedial Responses.

ICF Kaiser Engineers, Inc. 1998. Boomsnub/Airco Superfund Site Remedial Investigation Report.

USEPA 2000. Boomsnub/Airco Superfund Site Record of Decision.

**ATTACHMENT 3**

**Record of Decision Cleanup Criteria**

## Cleanup Levels for Groundwater Chemicals of Concen

**Media:** Groundwater

**Site Area:** Site-wide Groundwater OU

**Available Use:** Residential

**Controls to Ensure Restricted Use (if applicable):** Public Water Supplies Previously Provided to Impacted Property Owners

Chemical of Concern	CAS Number	MTCA B (g/L or ppb)	MCL (ug/L or ppb)	If MCL Sufficiently Protective	Basis	Practical Quantitation Limit (g/L or ppb)	Cleanup <sup>2</sup> Level (g/L or ppb)	Risk At Cleanup Level
Hexavalent Chromium	18540-29-9	80	no MCL	NA	MTCA B	5	80	HQ = 1
Chromium (Total)	7740-47-3	No MTCA B	100	Yes	MCL	5	100	NC
Bromodichloromethane	75-27-4	0.706	100	No	MTCA B	1	1	NC
Carbon Tetrachloride	56-23-5	0.337	5	No	MTCA B	1	1	$1.49 \times 10^{-5}$
1,2-Dibromo-3-Chloropropane	96-12-8	0.0313	0.2	Yes	MCL	1	0.2	$6.40 \times 10^{-6}$
Dibromochloromethane	124-48-1	0.521	100	NC	MTCA B	1	1	NC
1,2-Dichloroethane	107-06-2	0.481	5	Yes	MCL	1	5	$1.40 \times 10^{-5}$
1,1-Dichloroethene	75-25-4	0.0729	7	No	MTCA B	1	1	NC
Hexachlorobutadiene	87-68-3	0.561	no MCL	NA	MTCA B	5	5	NC
Tetrachloroethene	127-18-4	0.561	5	Yes	MCL	1	5	$5.83 \times 10^{-6}$
1,1,1-Trichloroethane	71-55-6	7,200	200	Yes	MCL	1	200	HQ = 0.0278
Trichloroethene	79-01-6	3.98	5	Yes	MCL	1	5	$1.26 \times 10^{-6}$

CAS - Chemical Abstract Service

HQ - hazard quotient

MCL - maximum contaminant level

NA - not applicable

NC - not calculated

## **Cleanup Levels for Groundwater Chemicals of Concern (Continued)**

Notes:

<sup>1</sup>Ecology Implementation Memo #3 of November 1993

<sup>2</sup>Cleanup level established as the higher of the regulatory level or the PQL; see WAC 173-340-700(6) and Ecology Implementation Memo #3 of November 24, 1993

<sup>3</sup>Where cleanup criteria is MTCA B, risk at cleanup level is calculated using MTCA assumptions

## Cleanup Levels for Soil Chemicals of Concern

**Media:** Soil

**Site Area:** Boomsnub Soil OU

**Available Use:** Industrial

**Controls to Ensure Restricted Use (if applicable):** Zoning for adjacent properties; deed restrictions for Boomsnub property only

Chemical of Concern	Cleanup Level (ppm or mg/kg)	Basis for Cleanup Level	Risk at Cleanup Level
Total Chromium	400	Site-specific remedial level <sup>1</sup>	NC
Chromium VI	8	MTCA 100x Groundwater Std. <sup>2</sup>	NC
	17,500	MTCA C Industrial	NC
Chromium III	1,600	MTCA 100x Groundwater Std. <sup>2</sup>	NC
Lead	1,000	MTCA A Industrial <sup>3</sup>	NC

NA - Not applicable

NC - Not calculated

Notes:

<sup>1</sup>The Site-specific remediation level will be demonstrated to be effective achieving the MTCA groundwater cleanup standard (80 ppb) for hexavalent chromium at nearby monitoring wells. Hexavalent chromium remaining in soil between 400 ppm and 8 ppm will be allowed to infiltrate to groundwater for ex-situ groundwater treatment.

<sup>2</sup>Soil cleanup level represents 100 times the MTCA groundwater cleanup level reported in the Ecology CLARCII database 2/28/96.

<sup>3</sup>MTCA Method A Industrial value shown for lead (no Method C Industrial value exists for lead).

**ATTACHMENT 4**

**Site Inspection Summary**

**Site Inspection  
Boommub/Airco Superfund Site**

**Date:** July 17, 2003

**Inspection Completed By:** Jerry DeMuro

**Site Representative:** Rick Read, EA Engineering Science and Technology

A site inspection was performed to evaluate the operation of the system assess system operational status. Photographic documentation of system components was also collected and is provided as Attachment A.

The system was fully operational at the time of the inspection. Seventeen of the 24 extraction wells were in operation with an extraction rate of approximately 155 gallons per minute (gpm). The system has been operating in compliance with permit conditions. No major system failures were reported.

A number of routine maintenance activities are regularly performed. Site improvement activities including painting and facility repair have also been completed.

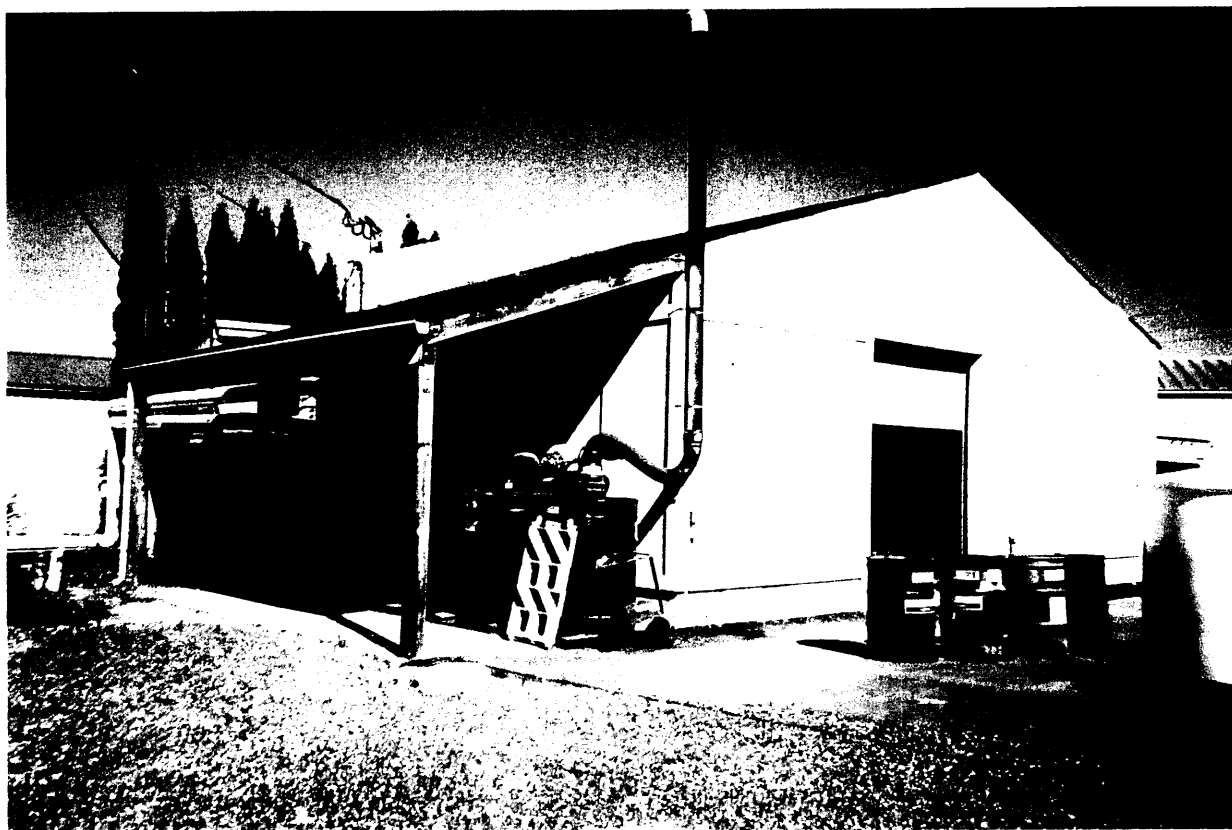
## **ATTACHMENT 5**

### **Site Photographs**

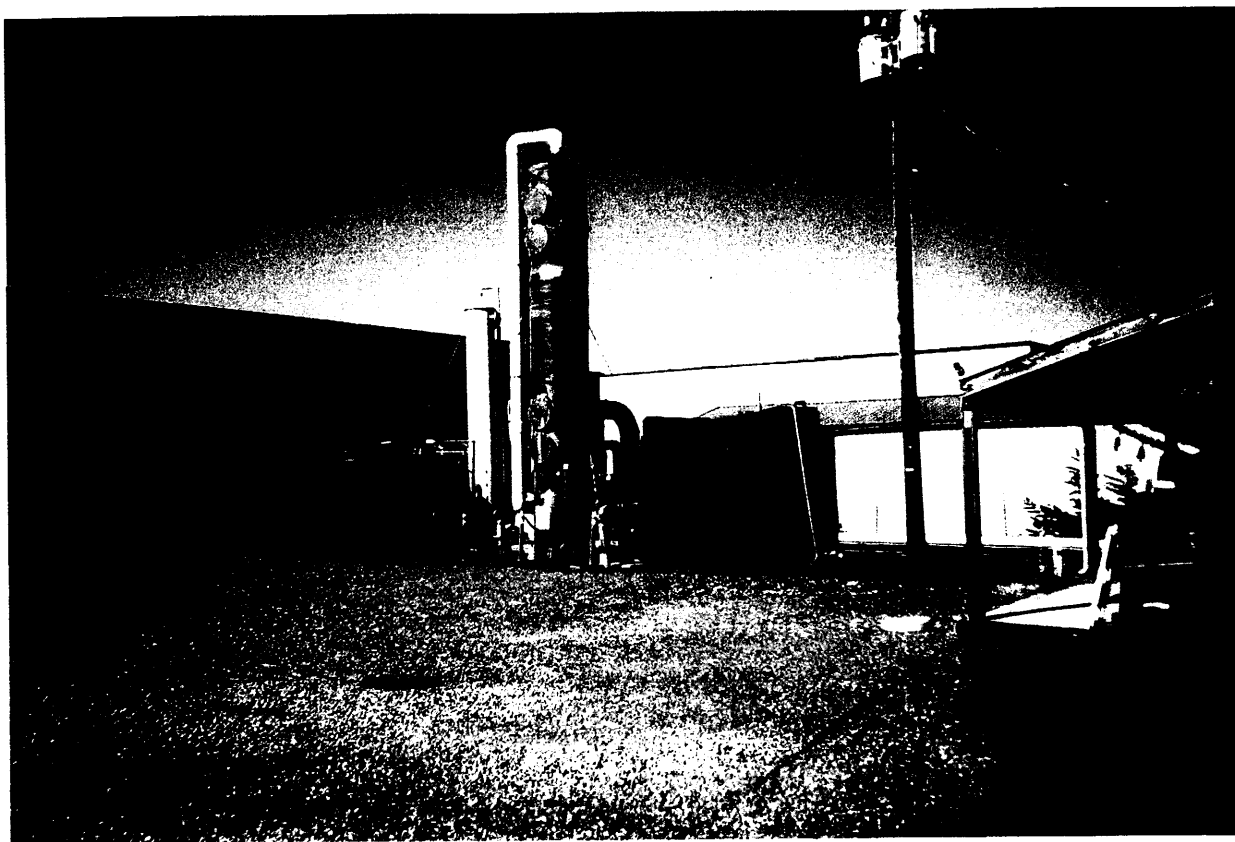




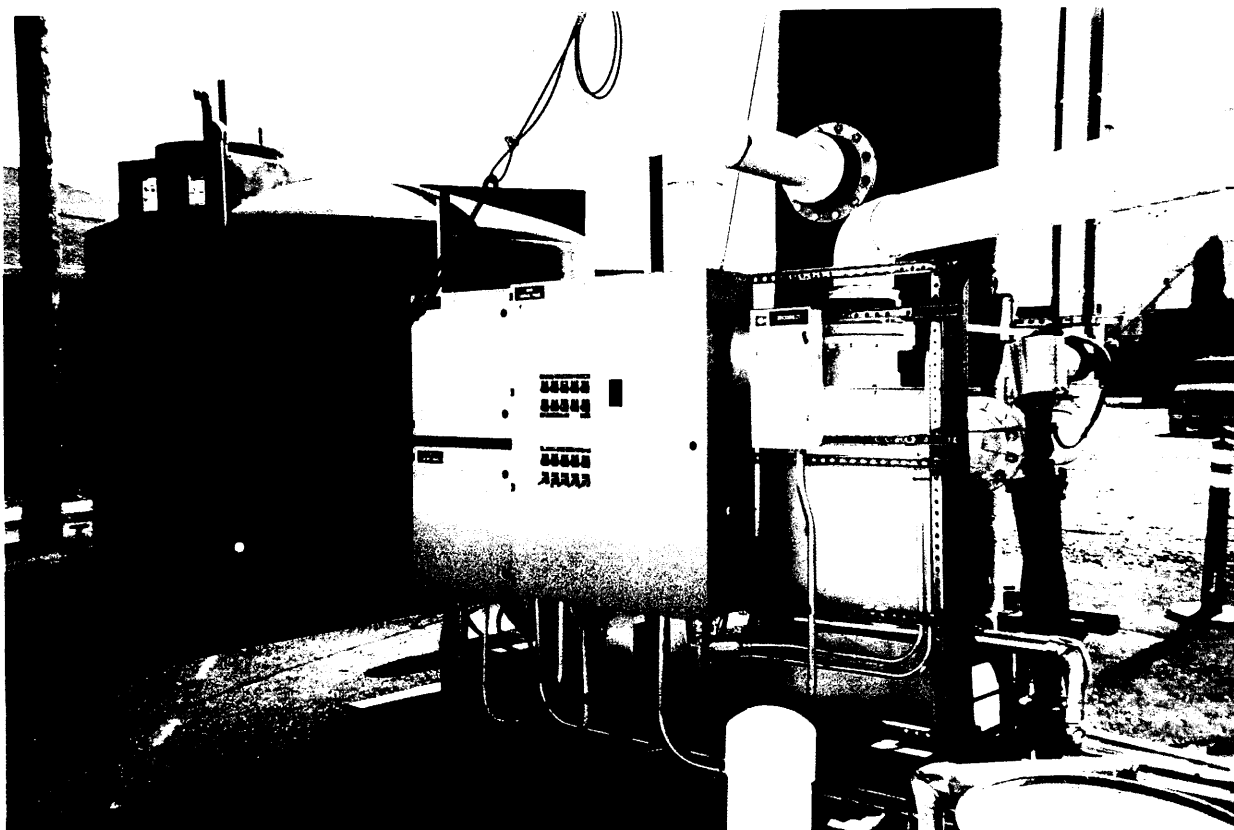
1. Treatment building.



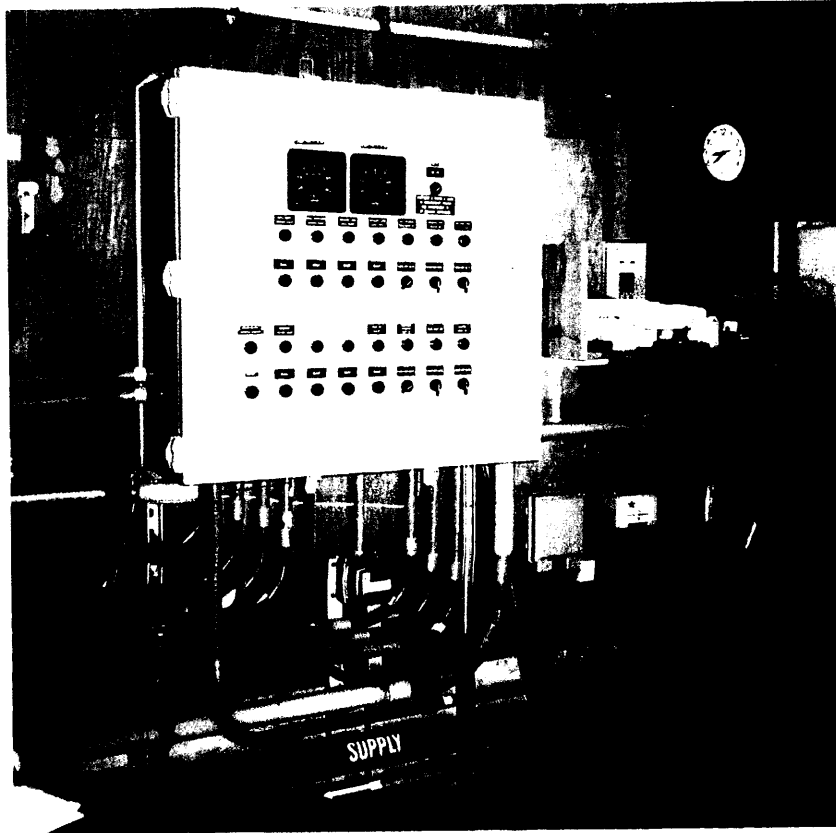
2. Treatment building showing air stripper off-gas treatment system.



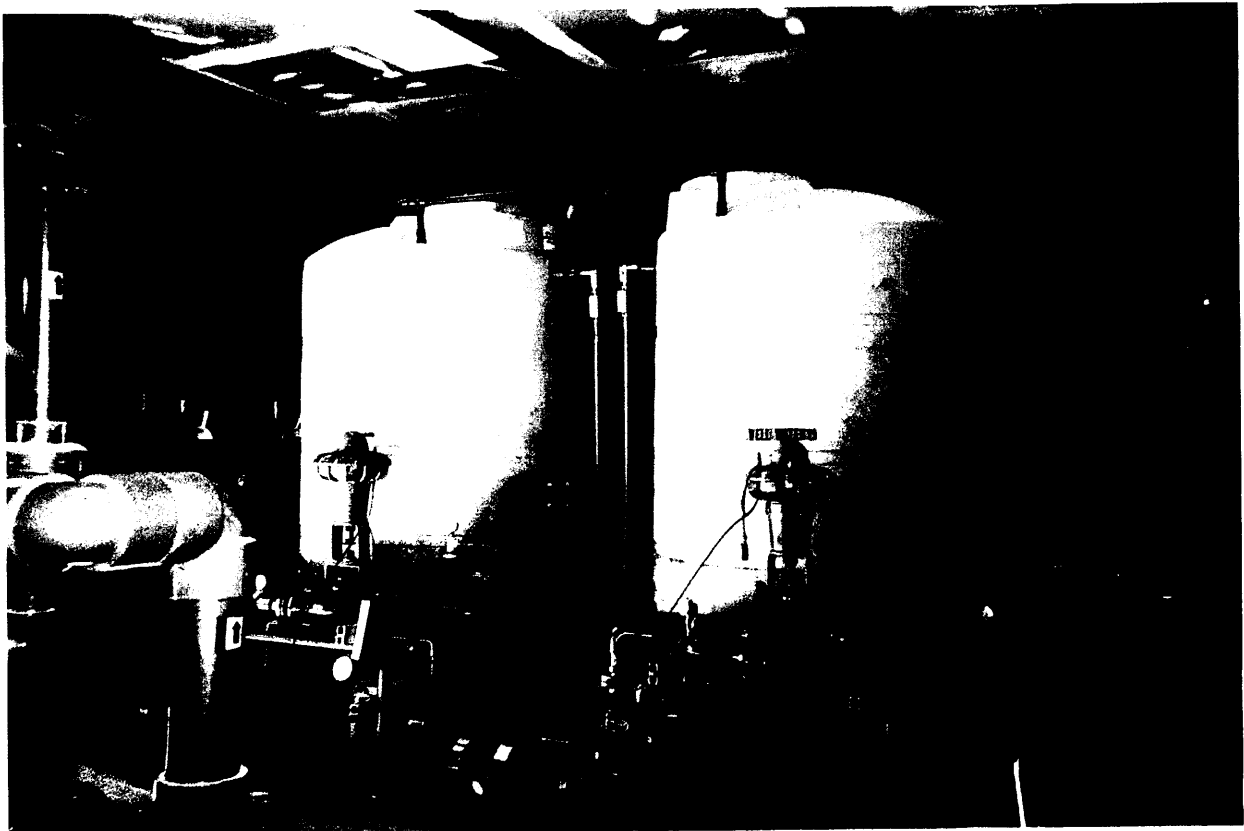
3. Air stripper.



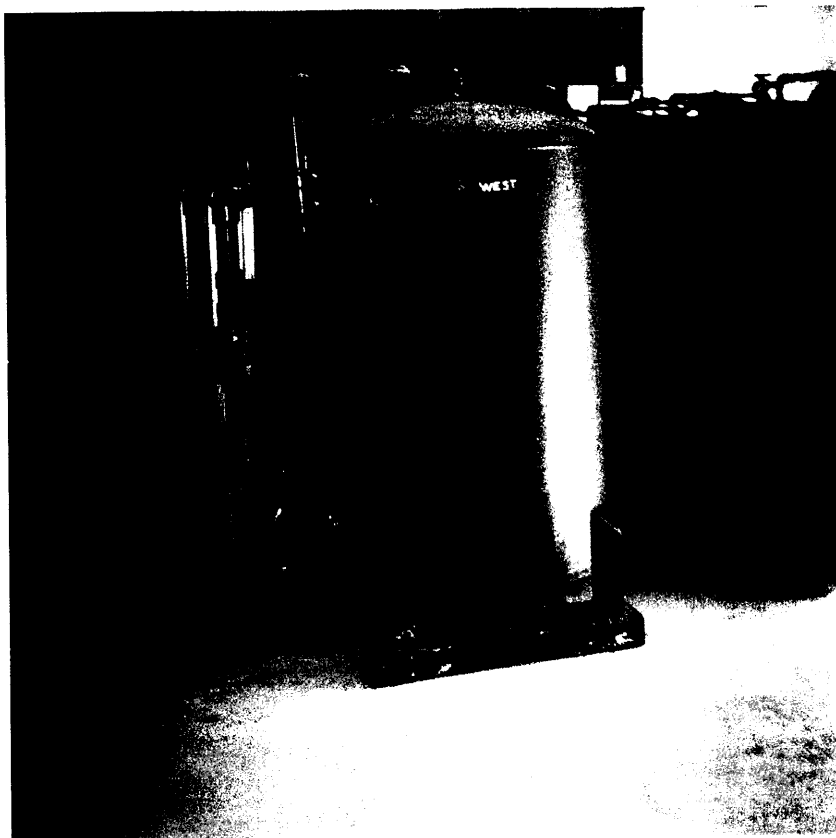
4. Air stripper control panel



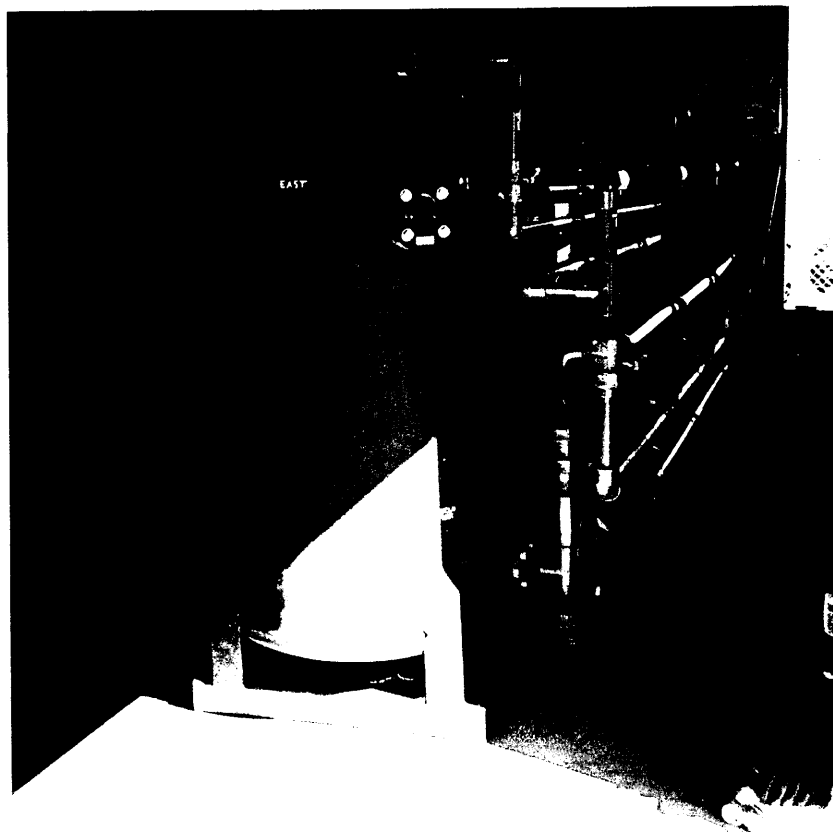
5. Extraction well control panel



6. Influent and effluent tanks.



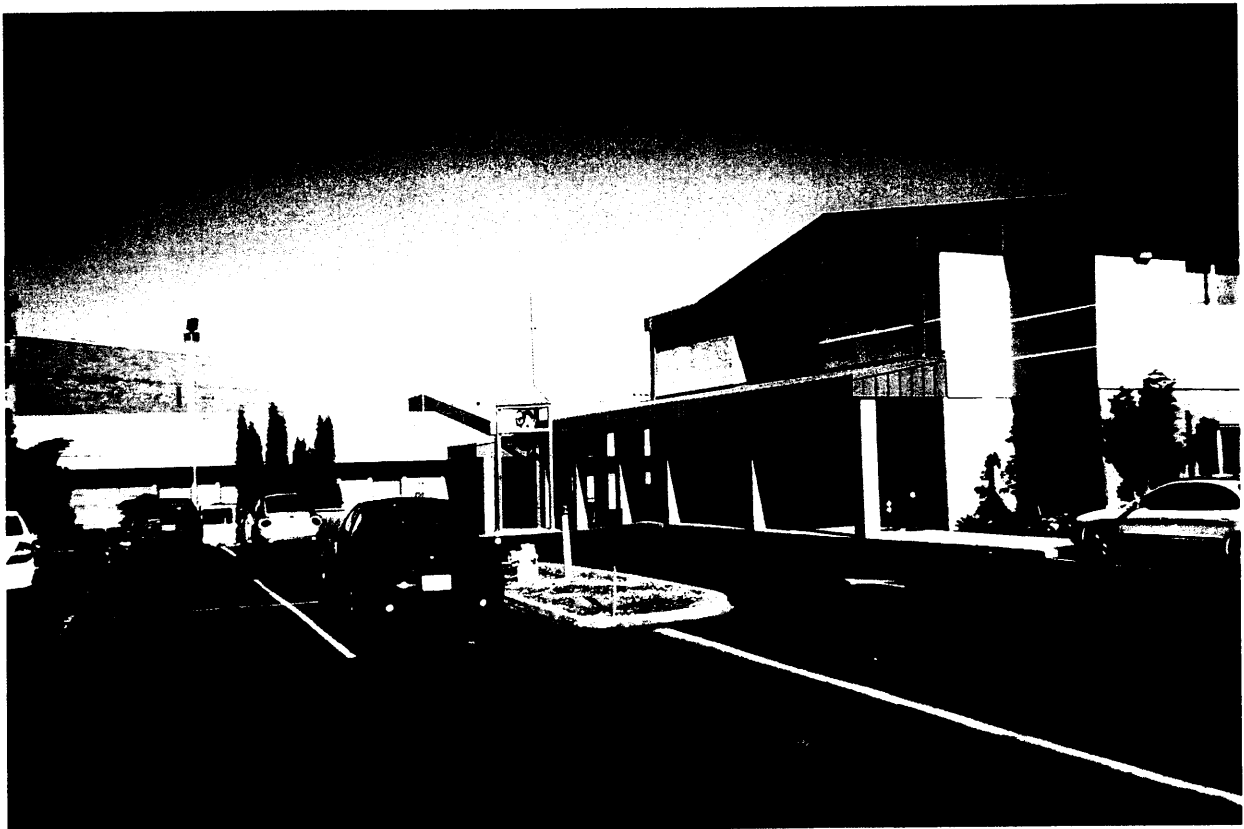
7. Ion exchange treatment train.



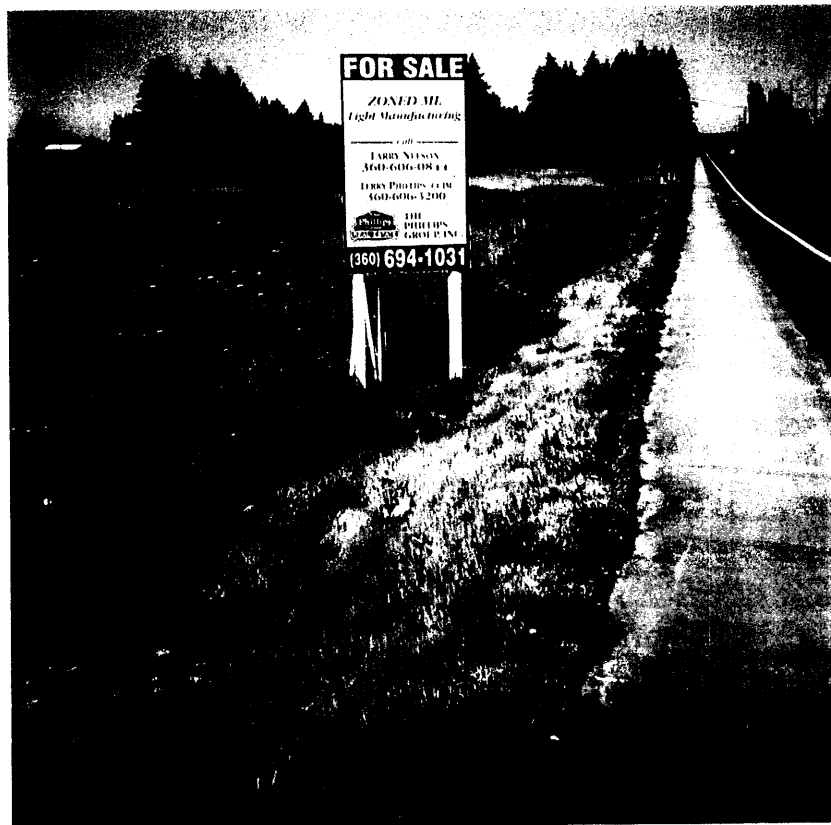
8. Ion exchange treatment train.



9. Church of God property.



10. Church of God property.



11. Parcel west of Shell station.



12. Parcel west of Shell station.



13. Toe of plume.



14. Toe of plume well control panel.

**ATTACHMENT 6**

**Interview Summaries**



## **Boommub/Airco Superfund Site Five Year Review Site Interviews/Inspection**

In association with the Five Year Review of the Boommub/Airco Superfund Site as required under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)§121 and the National Contingency Plan (NCP), URS Corporation completed interviews with nearby property owners and interested parties. The purpose of the interviews was to identify issues and concerns related to the implementation and on-going operation of the site remedy. In advance of the interviews a fact sheet was distributed to interested parties outlining the process for the five-year review and providing points-of-contact for those interested in providing site-related feedback to the EPA.

Interviews were performed either by telephone or thorough face to face meetings. Parties were identified for the interviews based on the following criteria:

Parties adjacent to the site or effected by site related contaminants  
Public entities/utilities effected by operation of the remedy  
Interested and concerned citizens or citizen groups.

Parties identified for interviews included:

Steve Prather	Clark County Public Utilities
Dotti Ramey, P.E.	City of Vancouver
Dan Huevel	Adjacent Property Owner
Wayne Amondson	Church of God (effected property) Business Administrator
Doug Ballou	NE Hazel Dell Neighborhood Association
Denise Anderson	Clark County Hazardous Waste Citizen's Task Force
Sandy Brackin	GL&V Cellico Adjacent Property
Sean McNamee	Speeds Towing Adjacent Property

Attempts to contact GL&V Cellico and Speeds Towing were unsuccessful; representatives of these adjacent properties were therefore not interviewed. Telephone interviews were performed with representatives of the NE Hazel Dell Neighborhood Association and the Clark County Hazardous Waste Citizen's Task Force; all other interviews were performed in face-to-face meetings held on July 17, 2003. Interviews included a review of activities completed to date at the site, site operational status, planned activities and issues/concerns with system operation. Overall, interviewees expressed few concerns with regard to system operation and appreciated the opportunity to be included in the five-year review process. The principal concern identified was related to the potential for site related constituents to enter regional groundwater supplies and the impact of site and associated remedy components (wells, pipelines, electrical controls) on the increasing levels of land development in the vicinity of the site.

Concurrent with the interviews, a site visit was also performed to assess the operational status of the remedy. Interview summaries and a site inspection report follow.

**Five Year Review Interview Summaries**  
**Boomsnub/Airco Superfund Site**

**Interviewee:** Steve Prather Water Quality Manager Clark Public Utilities

**Interviewer:** Jerry DeMuro URS Corporation

**Date of Interview:** July 17, 2003

Following a review of the site history and operational status of the remedy, the impacts of the site on Clark Public Utilities (CPU) was discussed. CPU operates drinking water supply wells in the vicinity of the site. These wells are screened in the Troutdale formation which is believed to be geologically isolated from the alluvial aquifer where site-related contaminants have been principally detected. Two of these wells (CPU-7 and CPU-23) are inactive for 9-10 months of the year and are only operated to meet peak summer-time water demands. Use of these wells for peaking was voluntarily initiated by CPU to minimize the potential of drawing trichloroethene (TCE) into the regional drinking water supply. Mr. Prather expressed concern that low levels of volatile organic compounds associated with the site, most notably TCE, have been detected in groundwater monitoring wells recently installed in the Troutdale formation downgradient of the site. Mr. Prather expressed an additional concern related to whether private wells that are known to have existed in the vicinity of the site remain in use and if not, whether these wells had been properly abandoned in accordance with state requirements. He suggested that the EPA may want to conduct a house-to-house survey of nearby properties to identify and evaluate the use of private wells in the vicinity of the site.

Mr. Prather indicated that the EPA and its contractors have kept CPU well informed and have supplied appropriate levels of information on site activities and conditions. He indicated that he would like to receive information on trends in specific wells as well as a plan of action for identifying and addressing the source of the low concentrations of TCE recently observed in the in the Troutdale wells.

Mr. Prather indicated that CPU currently performs monitoring of the Bennett and Garrison wells and would like to evaluate the possibility of EPA and/or site contractors assuming responsibility for performing monitoring of these wells as part of on-going groundwater monitoring activities. Mr. Prather believes that these or other wells in the vicinity may be monitored by the EPA and that it may be more cost effective for CPU to discontinue its monitoring and rely on data provided by the EPA and its contractors for its monitoring program.

Mr Prather also identified the possibility of CPU installing an additional groundwater production well to the north of existing CPU wells. Installation of this well is not likely to occur immediately; the decision for its installation will be based on the resultant need from the increased levels of development in the vicinity of the site. If and when an additional well is installed, CPU will coordinate well installation with EPA.

**Five Year Review Interview Summaries  
Boomsnub/Airco Superfund Site**

**Interviewee:** Steve Prather Water Quality Manager Clark Public Utilities

**Interviewer:** Jerry DeMuro URS Corporation

**Date of Interview:** July 17, 2003

**Followup Actions:**

Provide copy of Five Year Review Report to Steve Prather;

Discuss with EPA the possibility of assuming monitoring for the Bennett and Garrison wells;

Provide trend analyses for wells in the vicinity of the CPU wells to Steve Prather.

**Interview Summaries**  
**Boomsnub/Airco Superfund Site**

**Interviewee:** Dan Huevel Adjacent Property Owner

**Interviewer:** Jerry DeMuro URS Corporation

**Date of Interview:** July 17, 2003

Mr. Huevel owns property adjacent to and northwest of the Boomsnub property. Portions of the groundwater extraction pipeline and monitoring and extraction wells are located on the Huevel property. The property was used for equipment and materials staging for the installation of gravity sewer line in 2002. The property has recently been developed for light industrial use. Development included the construction of steel and aluminum structures constructed on at-grade slabs. Site development was coordinated with EPA such that buildings and supporting structures did not encroach on monitoring and extraction wells. All monitoring and extraction wells are located either in planting islands or parking lot surfaces on the property. The extraction line was relocated during site development such that the alignment remained outside of all building footprints.

During site development, Mr. Huevel encountered soils contaminated with polychlorinated biphenyls (PCBs). Because of the relatively low concentrations detected and the light industrial use of the site the Washington State Department of Ecology (Ecology) allowed areas of impacted soil to be left in place and capped. Ecology however, requires Mr. Huevel to monitor groundwater for the presence of PCBs. Mr. Huevel worked with Ecology to allow existing wells installed as part of the site remedy to be used for monitoring. He indicated that he has arranged with EA Engineering Science and Technology (EA) the consultant for the responsible party, BOC Gases, to perform monitoring for PCBs concurrently with routine site-related groundwater monitoring activities.

Mr. Huevel indicated that site access for sampling will need to be coordinated with future building tenants and that the truck gate installed at the rear of his property would remain available to the Agency should equipment access to the property be required.

Mr. Huevel indicated that the EPA and its contractors have kept him well informed and have supplied appropriate levels of information on site activities and conditions. He indicated that he would like to receive a copy of the Five Year Review upon its completion.

**Follow up Actions:**

Provide copy of Five Year Review Report to Mr. Huevel;

EA to contact Dan Huevel to coordinate sampling activities.

## **Interview Summaries**

### **Boomsnub/Airco Superfund Site**

**Interviewee:** Wayne Amondson, Business Administrator Church of God

**Interviewer:** Jerry DeMuro URS Corporation

**Date of Interview:** July 17, 2003

The Church of God property is located mid-plume. A number of extraction wells are located in the parking area of the Church and portions of the extraction pipeline traverse the Church property.

Mr. Amondson, through receipt of fact sheets and monitoring data, is aware of activities that have been completed at the Boomsnub site. Access to the Church property for well installation and sampling and equipment maintenance and monitoring has been coordinated with the Church such that Church-related activities are not adversely impacted. The Church has plans for significant expansion that may occur as early as the summer of 2005. Expansion plans have been developed such that proposed buildings and other structures do not encroach on existing site monitoring and extraction wells. A portion of the extraction pipeline between MW-25D and MW-27D may require relocation and/or abandonment prior to facility expansion. In addition, the well designated as the Woodaegge well, a private well associated with a former residence now owned by the Church and used as the location of "The Giving Closet," a Church service assisting the needy through collection and distribution of household items and clothing, will need to be abandoned. This well is located in the proposed footprint of one of the proposed buildings. The surface elevation of additional wells may also need to be raised/lowered to accommodate proposed surface elevation changes of the new development.

The Church also has expressed interest in acquiring the property to the west of the Church for additional expansion. Expansion to the west would likely include parking facilities with additional buildings located in the current parking area. This acquisition of the property to the west is not likely to occur until the estate of the current property owner is settled. A number of extraction and monitoring wells and a portion of the extraction line are located on the property located to the west of the Church. Development in this area will need to be coordinated such that impacts to the groundwater extraction system are limited.

#### **Follow-up Actions:**

Provide a copy of the Five Year Review to Mr. Amondson;

Coordinate site activities and requirements with the Church.

**Interview Summaries**  
**Boomsnub/Airco Superfund Site**

**Interviewee:** Dotti Ramey, P.E., Wastewater Management City of Vancouver

**Interviewer:** Jerry DeMuro URS Corporation

**Date of Interview:** July 17, 2003

Treated groundwater from the Boomsnub Site is discharged to the City of Vancouver Sanitary Wastewater collection and treatment system under permit 99-03 Mod. 2. The permit identifies discharge criteria and requires regular treatment system monitoring and reporting. The treatment system continues to operate in compliance with the conditions of the permit. The City, through receipt of fact sheets and monitoring data, is aware of activities that have been completed at the Boomsnub site. Data requests have been promptly addressed and documents received are of the appropriate level of quality. Communications with EA Engineering Science and Technology have been frequent and positive. Activities related to construction of the sewer line in 2002 were closely coordinated with the City.

The City is most concerned with ensuring that the treatment plant continue to operate in accordance with permit conditions. They remain open to discussions regarding any necessary permit modifications to enhance the efficiency of treatment plant operations. The City is supportive of alternatives being evaluate for potential reuse of treated groundwater as opposed to its direct discharge to the sanitary sewer system.

Ms. Ramey inquired as to the applicability of other treatment technologies to site-related contamination. She indicated that Frontier Hard Chrome is installing wells to inject dithionate and/or bisulfite and wondered if this technology is applicable to Boomsnub.

**Follow-up Actions:**

Provide a copy of the Five Year Review to Ms. Ramey;

Keep Ms. Ramey informed of water reuse alternatives development/evaluation.

**Telephone Interview Summaries**  
**Boomsnub/Airco Superfund Site**

**Interviewee:** Doug Ballou, NE Hazel Dell Neighborhood Association

**Interviewer:** Jerry DeMuro URS Corporation

**Date of Interview:** July 15, 2003

Mr. Ballou is the President of the NE Hazel Dell Neighborhood Association. He is familiar with the activities that have been performed at the site. He has received the fact sheet and intends to publish a notice in the Association Newsletter, (scheduled for distribution in August) alerting members of the Five Year Review process and identifying EPA points of contacts for members to obtain further site information or to discuss any site related concerns. Membership has not expressed any concerns regarding the site to him.

Issues of concern to the Association include the impact of site development on continued system operation. He indicated that an adjacent site (the Huevel property) has recently been developed and that a portion of the site bordering on 78<sup>th</sup> Street to the west of the Shell Station over which a portion of the extraction pipeline traverses is zoned for light industrial use and is for sale. Development of this parcel will require coordination with EPA to minimize potential site impacts.

**Follow-up Actions:**

Provide a copy of the Five Year Review to Mr. Ballou.

**Telephone Interview Summaries  
Boomsnub/Airco Superfund Site**

**Interviewee:** Denise Anderson Clark County Hazardous Waste Citizen's Task Force

**Interviewer:** Jerry DeMuro URS Corporation

**Date of Interview:** July 14, 2003

Ms. Anderson is a representative of the Clark County Hazardous Waste Citizen's Task Force that is concerned about the Boomsnub and other hazardous waste sites in the County. The Task Force has been kept informed of the status of the Boomsnub site through regular briefings. Key concerns of the Task Force are :

Is the remedy accomplishing its objectives?

Is Chromium being removed?

Are there other technologies that are applicable to the site?

Each of these questions will be addressed in the Five Year Review, a copy of which will be provided to the Task Force.

Ms. Anderson noted that membership in the Task Force has declined and that there are only a few active members. She planned on discussing the site status with them and will provide any comments the Task Force might have directly to EPA.

**Follow-up Actions:**

Provide a copy of the Five Year Review to the Task Force.



**Site Inspection  
Boomnub/Airco Superfund Site**

**Date:** July 17, 2003

**Inspection Completed By:** Jerry DeMuro

**Site Representative:** Rick Read, EA Engineering Science and Technology

A site inspection was performed to evaluate the operation of the system assess system operational status. Photographic documentation of system components was also collected and is provided as Attachment A.

The system was fully operational at the time of the inspection. Seventeen of the 24 extraction wells were in operation with an extraction rate of approximately 155 gallons per minute (gpm). The system has been operating in compliance with permit conditions. No major system failures were reported.

A number of routine maintenance activities are regularly performed. Site improvement activities including painting and facility repair have also been completed.